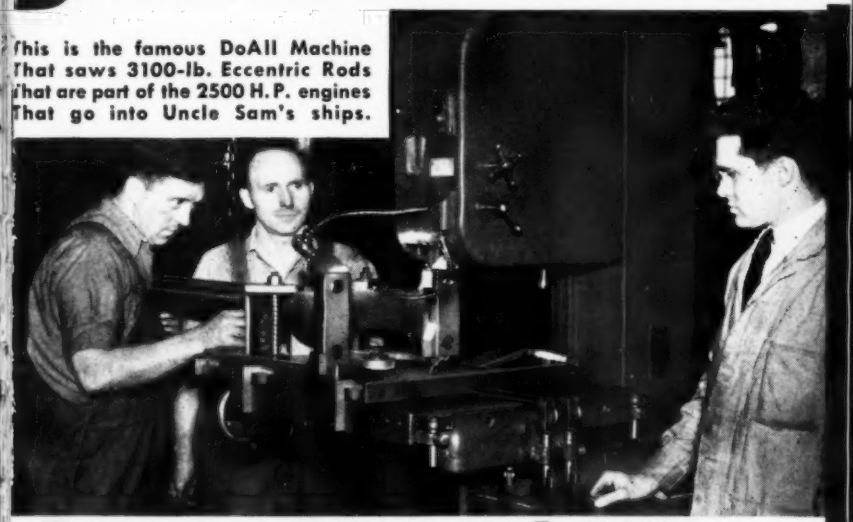
MACHINE TOOL BLUE BOOK

MARCH 1942

DoAll SPEEDS PRODUCTION

This is the famous DoAll Machine That saws 3100-lb. Eccentric Rods that are part of the 2500 H. P. engines That go into Uncle Sam's ships.



7 HOURS' WORK IN 1 HOUR . . .

● At Filer & Stowell, Milwaukee, Wis., this Connecting Rod formerly took 7 hours to machine by boring and slotting. Now DoAll does the same work in 1 hour, and the slotter and boring mill are released for other work.

Every plant where man-hour and man-energy savings are essential needs the DoAll. Every metal worker instantly recognizes the value of this modern production tool. Priced from $1000 to $5000 complete with necessary equipment. Worth its weight in gold — Investigate the DoAll at once.

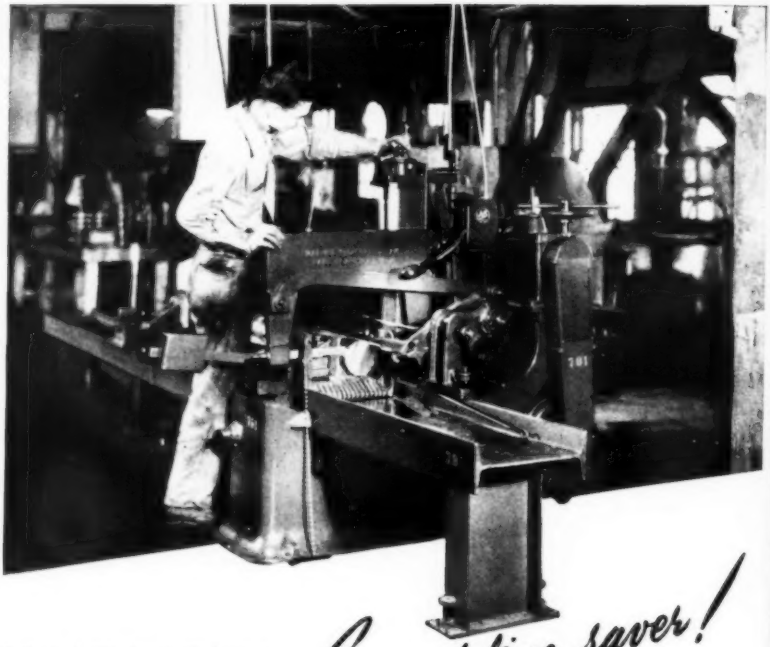
★ Fastest Precision Method of Removing Metal

DoAll Contour Sawing BAND SAWING BAND FILING BAND POLISHING

Let us send a factory-trained man to your plant with a DoAll to show you what it can do and save for you.

NEW—Interesting and valuable book "DoAll on Production" free on request.

CONTINENTAL MACHINES, INC. *Associated with the DOALL COMPANY, Des Plaines, Ill. Manufac-*



A great time saver!

for the Sidney Machine Tool Co.

• After 6 months of continuous high speed cutting-off (from S.A.E. 4150 bars heat treated to 28 Rockwell S.A.E. 4150 annealed, and S.A.E. 1335), Mr. L. S. Kirby, Superintendent of the Sidney Machine Tool Co., Sidney, Ohio, reports that his new MARVEL 9A has "given completely satisfactory service and proven to be highly efficient and a great time saver."

Much faster than any other accurate method of cutting off bar steel, these many-duty, all ball-bearing MARVEL Production Saws are eliminating "bottle necks" in stock rooms and cutting-off departments everywhere. Requiring no more attention than an automatic screw machine, they will cut identical lengths or slices from single or nested bars "automatically" . . . feed, measure, cut-off and stop at any pre-determined point.

No matter what your metal sawing problems, the MARVEL System of Metal Sawing supplies the best answer. The local MARVEL Metal Cutting engineer will upon request, study your requirement, and make recommendations as to methods and equipment.

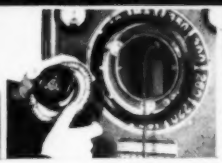
ARMSTRONG-BLUM MFG. CO., *"The Hack Saw People"* 5700 Bloomingdale Ave., Chicago, U.S.A.

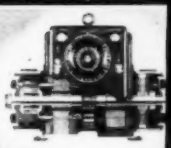
MARVEL SAWS

● Multi-Range Dual Control gives choice of 1,000 volt-ampere combinations. A right welding heat for all types of work.

● Remote Control gives operator finger-tip control of welding heat at the work, no matter how far work is from machine.

● Single unit compact design with 100% welded steel construction, guarantees minimum weight with greater strength.

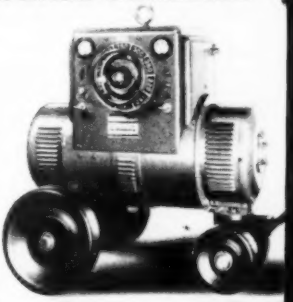




6 Reasons Why HOBART

ARC WELDERS HELP YOU MEET DEFENSE DEMANDS

The Defense Program asks for two things . . . increased production and quality workmanship. In no other method of metal fabrication can you get such speed as with arc welding. Ease of operation, convenience and construction features, low current and labor costs . . . all add up to make the Hobart Arc Welder the best on the market for performance, production and profit!



1. Increased Production
With the exclusive Hobart Multi-Range Control dial the operator selects exactly the right heat for every type of work. Liberal use of copper and cool operation lets the welder work continuously.

2. Quality Welds
While production speeds are increased, the quality of the weld remains uniform. Remote Control saves time when changing rods, position or work . . . guarantees right quality of welds. Amount of rejects is sharply reduced.

3. Dependable Operation
Hobart's oversize, 4-pole exciter insures quick arc recovery that minimizes "blow outs", and thus reduces chances of porosity in the weld. Straight or reverse polarity may be selected by the flip of a finger. Two-way meters give a quick check at all times.

4. Easily Adapted to Old or New Products. If you are not using Hobart Arc Welding, you are missing an opportunity to improve your product with better design, lower cost, less weight.

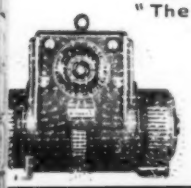
Write for Handbook EW-79 on Hobart Electrodes

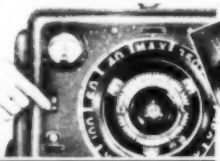
5. Compact Modern Design
The Hobart Arc Welder is 100% welded steel construction. All rotating parts are mounted between the bearings on the heavy-duty shaft.

6. Designed for Today and the Future. Today Hobart Arc Welders are indispensable in National Defense work. Tomorrow these same arc welders will deliver the high quality welds that made them so valuable today. Check coupon for details.

HOBART "Simplified" ARC WELDERS

"The Fastest Selling Arc Welders on the Market Today"





● Two-Way Ventilation cools welder twice as fast as conventional end-to-end method, making a cool operating welder always.

● Finger-tip polarity control gives correct polarity for all types of electrodes. Four-pole exciter guards against reversals.

New Catalog gives complete details on the Hobart line.

HOBART BROTHERS COMPANY
Box TB-32, TROY, OHIO
Please send further information together with new catalog on Hobart Multi-Range Arc Welders, especially on the items I've check below:

☐ Electric Drive ☐ Gasoline Drive
☐ Welding School
☐ Hobart Electrodes

Name _____

Address _____

RIVETT 715

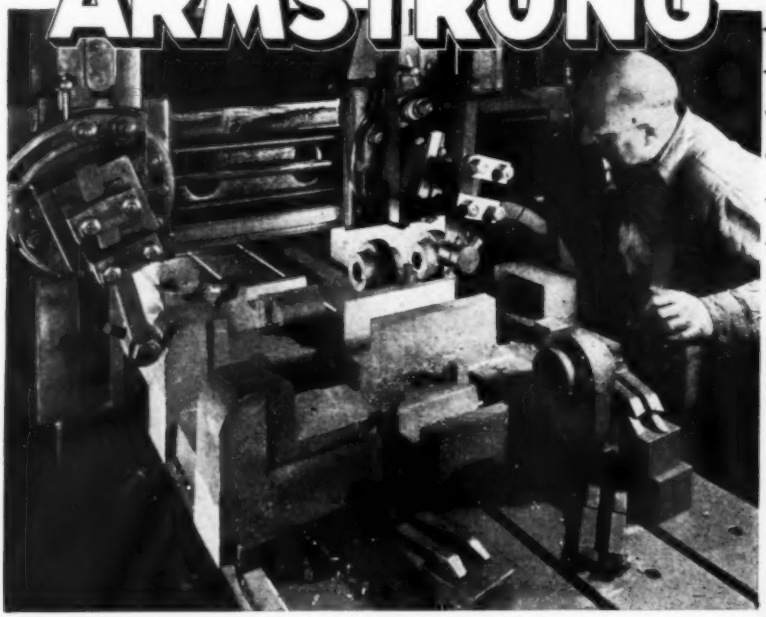
All in a Name:

"RIVETT" stands for 53 years experience in the building of precision bench lathes. "715" stands for a sensitive high speed, light duty, precision bench lathe having 7" swing and 15" center distance. The spindle runs in true dynamic balance at selective speeds from 100 to 3500 r.p.m. and takes draw-in collets up to ¾" diameter capacity. For further information on this and other Rivett bench lathes write today.

RIVETT LATHE & GRINDER INC.
BRIGHTON, BOSTON, MASS.
PIONEERS IN BENCH LATHE DEVELOPMENT

MORRISON
will not compromise
WITH QUALITY
MORRISON
means
Engineered
COLLETS AND
FEED FINGERS
HARDINGE BROTHERS, Inc.
ELMIRA, N. Y.
"PERFORMANCE HAS ESTABLISHED LEADERSHIP FOR HARDINGE"

ARMSTRONG



ARMSTRONG PLANER TOOLS

Speed up any planing job!

With an ARMSTRONG Planer Tool for each planer head, you can start any planer job without waiting to "tool-up", for "tooling-up", is reduced to selection of cutters, adjustment of cutter angle and clearance and tightening the set nut. These permanent, all-purpose tool holders take cutters quickly ground from standard high speed steel "squares" or "flats." They hold cutters at any angle . . . right or left . . . and at any clearance, always permitting the most efficient approach to the cut. They hold cutters ahead of center for extreme rigidity, or behind center when "gooseneck" tool is wanted, as for keyways or for heavy cuts on especially tough steel. Because of the extreme adjustability of these tools, it is often possible to complete jobs requiring top and side planing, under-cutting and, sectional interrupted cuts without moving work on the bed of planer. It is the most efficient planer tool obtainable for all planer operations, except where extremely large areas are to be surfaced. For large surfaces, the ARMSTRONG Gang Planer Tool is recommended, for it will cut planing time as much as 60%.

ARMSTRONG BROS. TOOL CO.

"THE TOOL HOLDER PEOPLE"

308 N. FRANCISCO AVE., CHICAGO, U. S. A.

Eastern Warehouse & Sales: 199 Lafayette St., New York, N. Y.

ARMSTRONG TOOL HOLDERS Are Used in Over 96% of the Machine Shops and Tool Rooms

Machine Tool Blue Book

Hitchcock Publishing Co., 508 So. Dearborn St., Chicago

33,000 This Issue *Volume 38, No. 3*

MARCH 1942

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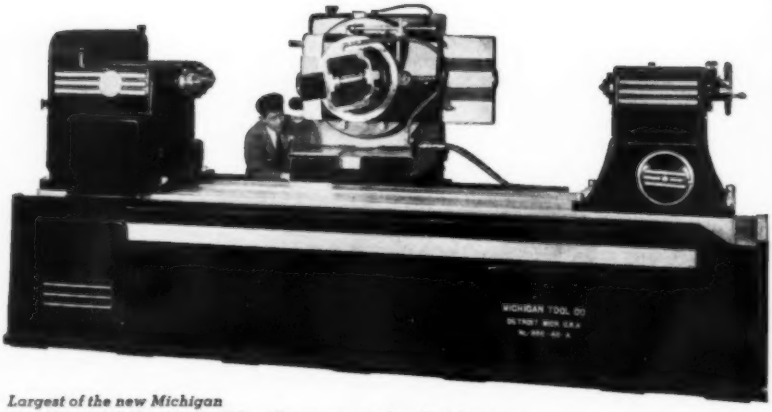
Subscription rate: $3.00 per year to individuals who are not executives in metal-working plants.

Announcing

A LINE of "FINISHERS" FOR LARGER GEARS



Largest of the new Michigan line, the model illustrated will handle gears up to four feet diameter.

MAKING AVAILABLE the crossed axis principle of gear finishing for all sizes of gears up to 4 ft. diameter, this new line of "Michigans" is designed to provide quietness, accuracy and life for large gears comparable to those now achieved in smaller gears by use of the "shaving" process.

Today, in the smaller sizes of gears—up to 18 inches—more gears are finished on Michigans than on all other types combined. "Tomorrow," probably the majority of large gears will be shaved.

And in such gears . . . for speed reducers for ships and power plants . . . for machine tools and all kinds of heavy machinery . . . for ordnance, etc. . . . . the use of this process will probably make possible a reduction in size by virtue of the higher load capacity obtained through greater accuracy.

The new line comprises three machines, as shown below. All machines are designed for heavy duty, and will take gears up to 20 inch face width.

The machine illustrated is an 865-48 —the largest gear finisher ever built. It is already in operation turning out gears in a defense production plant.

Model	For Gear Diameters		Distance between Centers (in.)
	Max. (in.)	Min. (in.)	
862-24	24	1	36*
862-36	36	2	48*
865-48	48	4	97

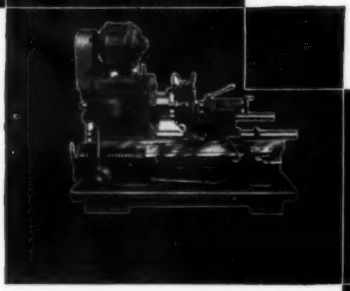
*May be increased on special order.

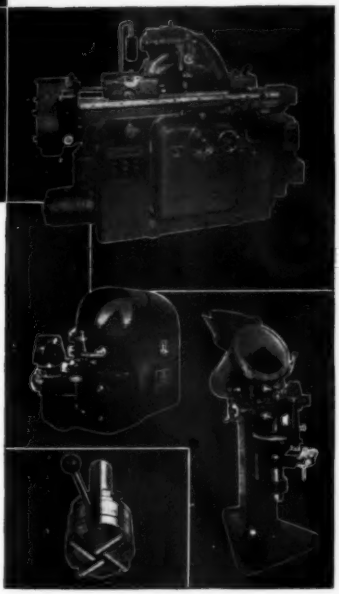
MICHIGAN TOOL COMPANY
7171 E. McNichols Road, Detroit, U. S. A.

PROFIT PRODUCING

MACHINE TOOLS

RAM & SADDLE TYPE
—UNIVERSAL TURRET LATHES
—FAY AUTOMATIC LATHES
—AUTOMATIC THREAD GRINDERS
—COMPARATORS for Inspection by Projection
AUTOMATIC OPENING
THREADING
DIES & CHASERS





JONES & LAMSON
MACHINE COMPANY

SPRINGFIELD, VERMONT,

U. S. A.

If You Know WHY.

CINCINNATI

THE CINCINNATI MILLING MACHINE CO.

Knowing HOW Will Show Better Results

THEORY and practice of the milling process are discussed at length in two CINCINNATI publications:

Physics of Metal Cutting
Milling Machine Practice

Either one or both of these publications may be obtained at no obligation whatever. Together, they give a new milling machine operator a start in the right direction . . . give the experienced man a fuller understanding of his work.

Knowledge gained from CINCINNATI metal cutting research has gone not only into booklets but also into the design of machine tools for today's and tomorrow's metal processing operations. The CINCINNATI 0-8 Plain Automatic Milling Machine, for example, embodies the latest engineering principles which combine to offer four big advantages:

1. Rapid production.
2. Better-than-average accuracy.
3. Quick set-up elements (such as the cycle selector)
4. A new field of automatic milling. (Vertical down feed synchronized with table longitudinal feed)

Other advantages of the 0-8 in milling small, intricate parts may be found in Sweet's Catalog File. Write to us for complete description and specifications; ask for catalog M-964.

● CINCINNATI No. 0-8 Plain Automatic Milling Machine with Automatic Rise and Fall Spindle Carrier.

NORTON GRINDERS ROLL OFF

NORTON
GRINDING MACHINES

. . to keep 'em flyin'

NORTON SERVICE FOR VICTORY

V . . . - V . . . - V

—Twenty-four hours a day

—Seven days a week

—From five assembly lines

—From greatly augmented assembly floor space

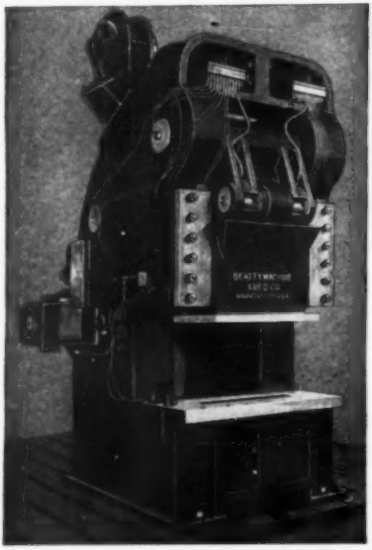
—Aided by machining and assembly facilities of many sub-contractors.

That's how Norton is answering the call for grinders and lappers — machines vital in the production of tanks, planes and guns—vital wherever both high production and high precision are essential.

NORTON COMPANY
WORCESTER, MASS.

M-442

. . . to keep 'em fightin'



No. 16 TOGGLE PUNCH PRESS

The No. 16 TOGGLE with large die space is suitable for punching and shearing tie plates, punching and straightening splice bars, also for general manufacturing press, punching and shearing articles. Drive is mounted inside of frame.

The Press is equipped with magnetic or air clutch. This is a high speed heavy duty Press for many applications.

GENERAL DIMENSIONS:

	No. 16	No. 16A	No. 16B
Face of slide, right to left	43'	53'	62'
Face of slide, front to back	24'	26'	26'
Die space, slide down	20'	20'	20'
Stroke; Standard	3'	3'	3'
Maximum	5'	5'	5'
Face of table, right to left	53'	60'	66'
Face of table, front to back	24'	26'	26'
Capacity	700T	850T	1000T
Strokes	40	35	30
Depth of throat	15½'	15½'	15½'
Weight	76,000	82,000	88,000 lb.
Motor required Horse Power	20	30	40

BEATTY MACHINE & MANUFACTURING CO.

HAMMOND, INDIANA

ALSO BUILDERS OF

Punches: Single and Double—"C" Frame
Horizontal Punches
Multiple Punches
Gate Shears
Bar Shears
Angle Shears
Splitting Shears
Coping Machines
The CoPun Shear (Cope Punch Shear)
Vertical Bulldozers
Spacing Tables
Hydraulic Press Brake and Flanger.
Hydraulic Presses.

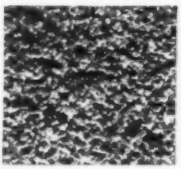
TEST THIS NEW, FASTER COOLER GRINDING WHEEL

PROVE TO YOURSELF IT WILL DO 2 TO 5 TIMES MORE WORK PER MAN PER MACHINE

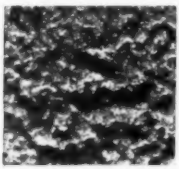
It's hard to believe . . . at first . . . that by simply changing to a new kind of grinding wheel production can be stepped up 2 to 5 times. But it's true.

NEW PATENTED CONSTRUCTION. This wheel, called Por-os-way, is made by a new patented process. Look at the wheel carefully and you'll see that the structure resembles a sponge . . . full of large air cells.

PRACTICALLY ELIMINATES "BURNING." The air cells cool each grinding point between contacts. The wheel runs cool, shows little or no tendency to burn the work even in the hands of an unskilled operator. This means you can take cuts far deeper than ever before, or your usual cut at a faster feed. Actual tests show an increase in production per man per machine of 100 to 400%.



Usual wheel, magnified. Note the compact, "sandy" appearance.



Por-os-way structure, cellular, "stringy" like a sponge, but tough.

Grain, Grade and magnification Size are Identical

FREE CUTTING. The Por-os-way wheel is amazingly free cutting because its porous structure reduces loading to a minimum. You can grind not only the hardest steels but softer materials such as copper, aluminum, wood, tin, rubber or plastics. The Por-os-way holds its corner and requires a minimum of dressing, due to the use of a tough new vitrified bond.

"PRESCRIPTION" FITTED. Por-os-way wheels are not stock wheels. They are made to order for your conditions of grinding. Write to us for a demonstration of this new wheel today. Let us prove to you that it is faster, cooler and free cutting on your job.

Today

SHELLS

This AVEY Drilling machine drills and taps—speedily and efficiently—75 m/m—90 m/m—and 105 m/m shells for defense. That's one of its jobs for today.

OPERATION
Drill and tap 5/16—18 thread lock screw hole in shell nose.
Two Position Sliding Fixture.

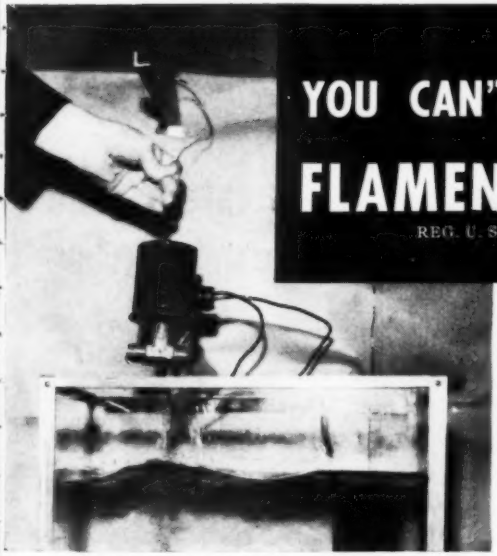
Tomorrow

When peacetime requirements are again first—this AVEY drilling machine—because it is standard design—retains the place for which it was originally intended — YOUR PRODUCTION LINE — certainly a wise investment — this AVEY drilling machine that will do TODAY'S JOB and TOMORROW'S JOB.

Because this AVEY DRILLING MACHINE is standard design — your order will receive better delivery.

THE AVEY DRILLING MACHINE CO.
CINCINNATI • OHIO

Avey DRILLING MACHINES
CINCINNATI · OHIO



YOU CAN'T DROWN FLAMENOL WIRE

REG. U. S. PAT. OFF.

Water, Oils, Coolants, Inks, Mild Acids IT RESISTS THEM ALL!

CONTINUOUSLY under water for six months, this valve and its standard Flamenol wire leads were entirely serviceable when they emerged—just as good as when they were submerged. During the test, current was turned on and off continuously.

This is one of 25 tests by Alco Valve Company, St. Louis, Mo., which proved that Flamenol wire meets the toughest machine-operating conditions. Flamenol wire

—will not support flame.

—is unharmed by splashing oil, inks, coolants, other liquids.

—offers high resistance to abrasion.

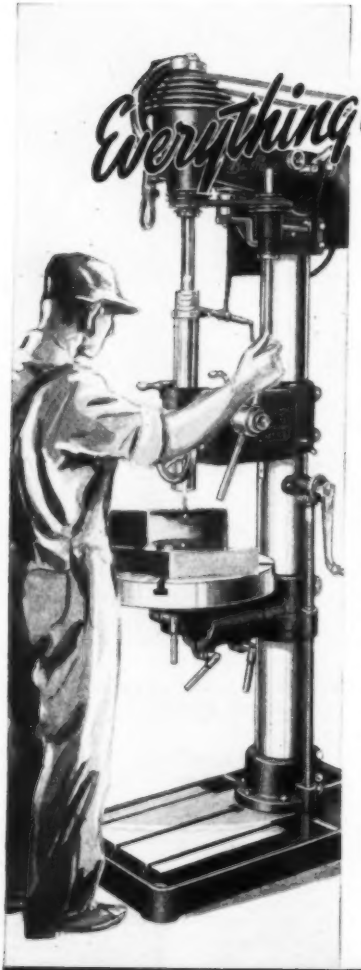
—is flexible. Wound on 1½ times its diameter, it shows no cracking after subjection to aging and to sustained heat or cold (60 C and minus 10 C, respectively).

For further data—sizes, colors, prices—consult our local office. ***General Electric Company, Schenectady, N. Y.***

GENERAL ELECTRIC INSULATED CABLE

THE RIGHT TYPE FOR EACH JOB

GENERAL ELECTRIC



Everything Under Control

. . . for Faster, More Accurate Drilling

• CONTROL is a first requirement for swift, accurate production drilling. And right there you have the secret of the faster output of Buffalo Drilling Machines. The operator always has "everything under control".

Buffalo Drills are designed and built to increase the operator's coordination through intelligent placing of **all** controls for fast and easy manipulation—and for minimum muscular fatigue. Saving in set up time is provided by the simplicity and quick adjustment of sliding heads and tables . . . throughout every detail of design and construction, Buffalo Drills are efficient team-mates of Industry in today's fast-moving war production.

BUFFALO FORGE COMPANY
161 Mortimer St., Buffalo, N.Y.
Canadian Blower & Forge Co., Ltd.,
Kitchener, Ont.

"Buffalo" **DRILLING MACHINES**

BOUT of the O'TOOLS (ROUND 3)

10 ROUNDS—AIR VS. HIGH-CYCLE GRINDERS

HIGH-CYCLE BEATS AIR on this DEFENSE JOB

SET-UP:

At Diebold Safe & Lock Co., Canton, Ohio.

Job: Finish grinding armored bodies for scout cars. Had both AIR and HIGH-CYCLE Tools. Needed more tools for defense production. Air pressure was low.

The *Rotor Analyst* considered all angles and recommended HIGH-CYCLE Grinders with these results:

SCORE:

HIGH-CYCLE takes Round 3 in the Bout of the O'Tools with these wallops:

Doubles production with fewer tools. 10 HIGH-CYCLE tools replace 15 AIR tools and do the work twice as fast.

Half the effort. Operators like HIGH-CYCLE tools because of easy portability to all parts of cars. (No hose to lug.)

Saves 60% in first cost. (Frequency changer costs less than air compressor.)

Saves 75% in power cost.

ASK THE ROTOR ANALYST HOW TO BOOST YOUR OUTPUT

How can you speed up production of your present AIR or HIGH-CYCLE installation? Want to increase its capacity and minimize the investment cost? Want to reduce outage time of your tools? Ask the *Rotor Analyst* for his unbiased suggestions. No obligation.

The Rotor Analyst has 65 different AIR tools and 99 different HIGH-CYCLE tools with which to solve your problems.

WHERE SHOULD HEAT TREATING HEAT GO?

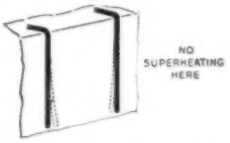
Comments on Salt Baths of Vital Importance to Anyone Doing Heat Treating

THE VERY OBVIOUS answer to "Where should the heat go?" is that it should go into the work as rapidly and as uniformly as possible and without causing superheating.

To accomplish this the heat must first be generated within the pot in such a manner as to insure the best distribution—no matter what kind of work is placed in the pot. Moreover, most of the heat should remain in the pot until it is removed as an integral part of the work itself.

Concentrated hot spots must be avoided—otherwise cracking of large pieces being treated at high temperatures is liable to result. At lower temperatures, superheated areas will swiftly decompose salts and a carburizing bath cannot do its work if it is "out of balance."

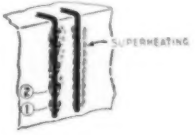
The highest heat treating speeds possible are accomplished with liquid baths. The internally heated salt baths are usually considered "tops" in speed. These baths are heated by placing electrodes in the salt itself, heating being accomplished by the resistance of the salt to the passage of the current. If the electrodes are placed close together there is a good chance that the high heat will warp them into contact with each other or even approaching each other to cause super-heating. The dotted lines in this sketch show how heat-warped electrodes can ruin an otherwise perfect salt bath balance. By selecting a furnace with the electrodes placed as in this sketch,



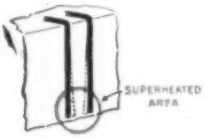
extreme warpage (dotted lines) could not induce the superheating. Rule number 1 should be to look for a furnace with plenty of distance (in feet rather than inches) between electrodes.

No matter where heat *should* go, it will always tend to rise vertically. This is true, of course, for any heated gas or liquid. It is possible, by the use of physical force, to make the heated substance go in *any* direction for a short distance, but when the force that turns it from its natural direction ceases, the heat immediately turns upward.

If the electrodes in the salt bath are placed vertically, this is what happens: the heated salt (at 1) that surrounds the



bottom of the electrodes rises. As it starts up, it encounters salt that is heated at, say, point 2. These two join forces, so to

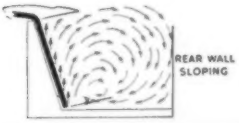


speak, by combining their respective heat and a superheating immediately starts. This progressive heating continues upward along the entire length of the electrode. It is easy to imagine the temperature that exists in the salt before it even gets to the surface.

When electrodes are placed like this,

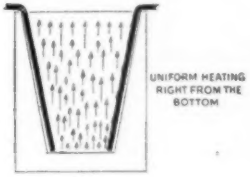
the heated salt rising from any one point does not co-mingle and add its heat to salt rising from farther on up the electrode. Thus, progressive heating cannot affect the salt balance. Rule 2: Get pots with sloping walls.

Since the motion of the heated salt is directly upward from the electrode, it is replaced by cooler salt from the bottom of the pot. The resultant circulation action is rapid, complete and uniform with the salt moving down the vertical wall toward the bottom of the pot for reheating. This natural, unforced circulation has proven especially valuable on large size work and on small work where rapid uniform heating at high speed is required.



Saw blades present an interesting problem in heat treating and illustrate why electrodes are placed at diagonal corners. Saw blades are long, they must be heated uniformly and rapidly. All the salt in the extremely deep pot they require must be uniformly heated. This means that heat must be supplied at or near the bottom.

To get the most heat there, electrodes are placed in diagonally opposite corners of the pot with their ends converging at the bottom. The greatest current flow is at the bottom of the pot. Consequently, the greatest amount of heat is generated there to flow upwards, intermingling and lending its heat to the work suspended in



the pot. Rule 3: be sure heat is generated *normally* at the bottom of the pot.

Even in high temperature work, where superheating is not as important a danger as it is in the carburizing baths, there is no concentration of heat. The electricity heating the salt spreads the heat over the entire area of the pot. This is the basis, in part, of the ELECTROTHERMIC-PERMEATION principle of operation.

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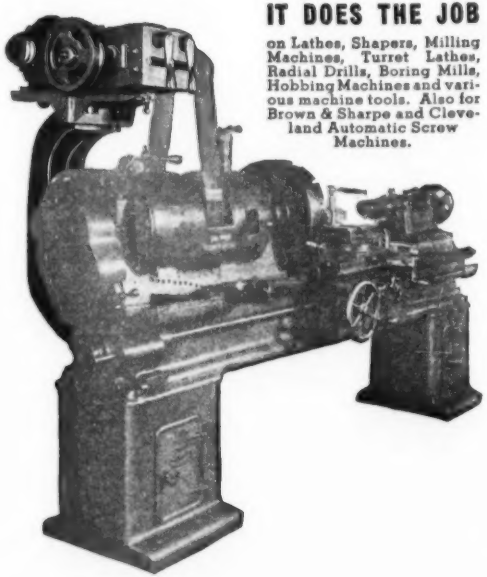

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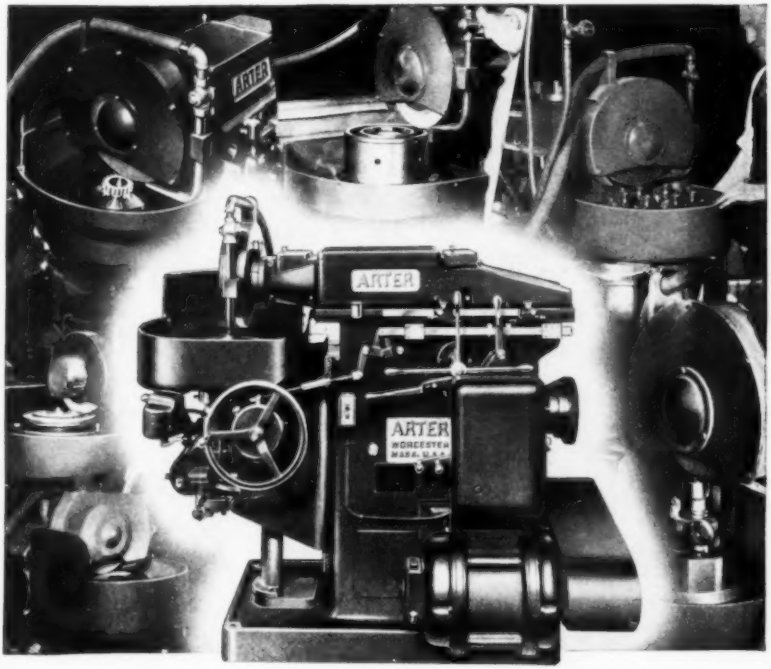

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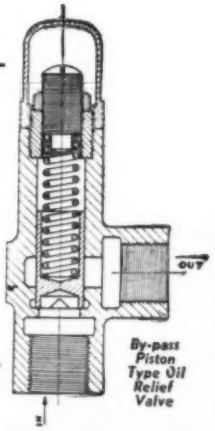

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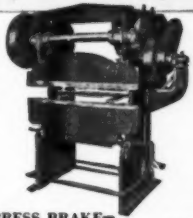

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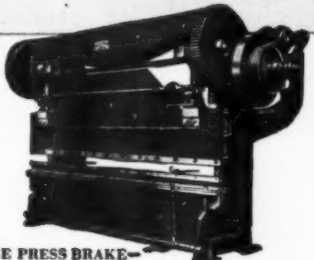

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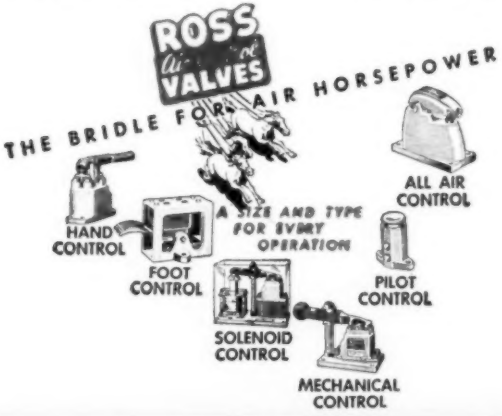

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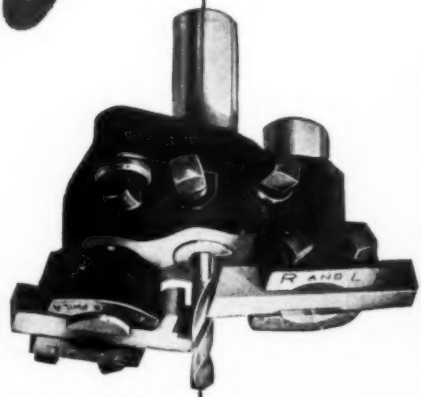

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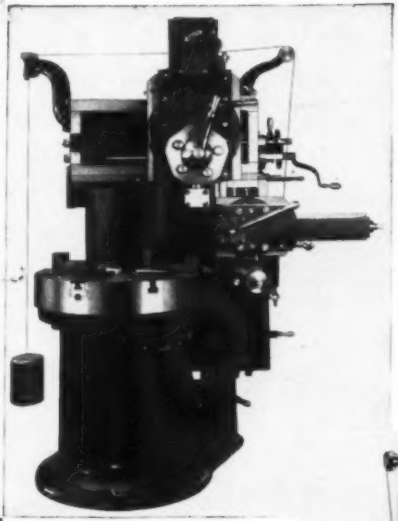

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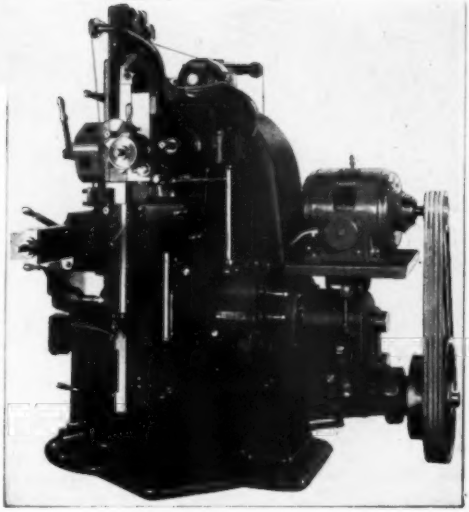

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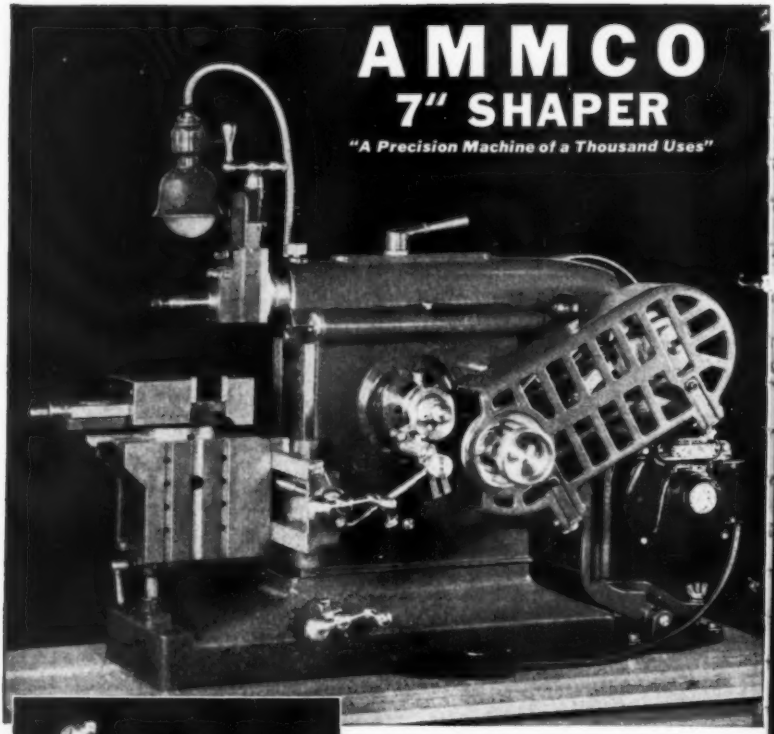

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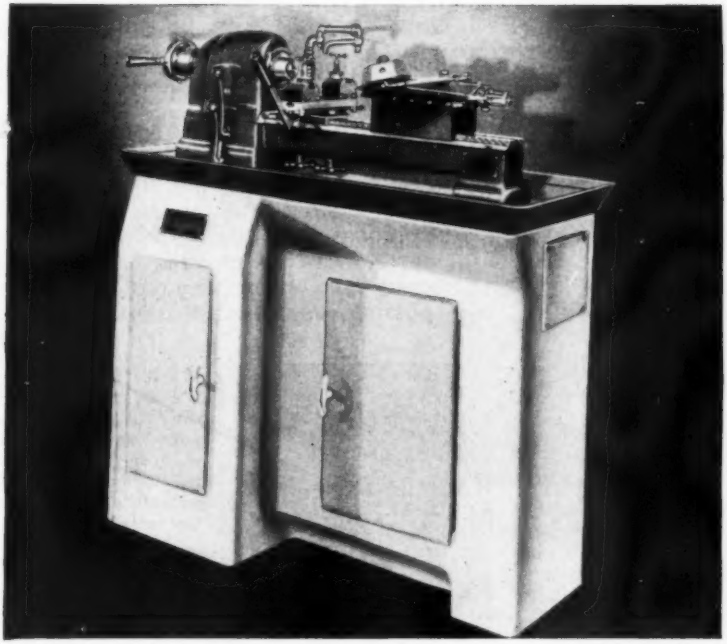

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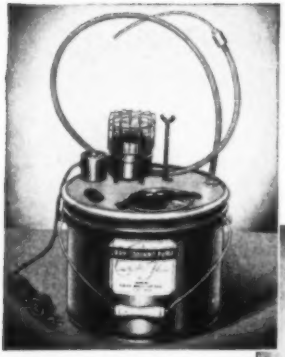

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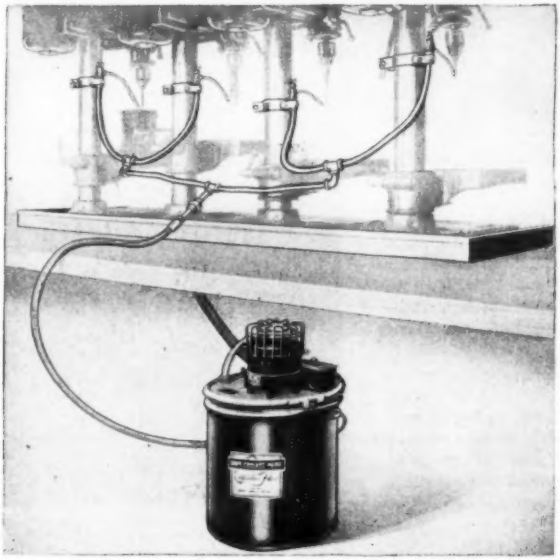

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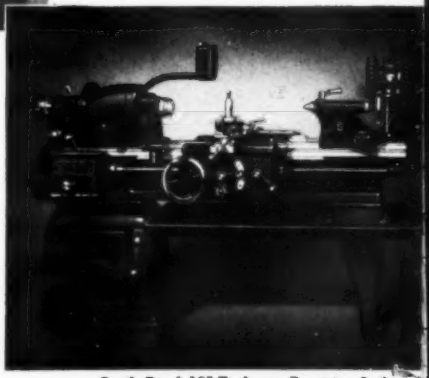

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Editor's Page

WINNING this war is no part time job. It means that all of us must dig in and help turn out military goods this year at a rate far higher than the world has ever known before . . . a rate the dictators say is impossible.

Every weapon we produce today is worth 10 we might produce next year. This is a mighty critical year in the history of our republic. We're ahead of where we might have been if some of our foresighted patriots hadn't used their initiative. But we've wasted a lot of time that could have been devoted to building fighting equipment. We still have 10 more months of 1942. If we throw everything we have into the job from now on, we can do it.

It means denial and sacrifices . . . but the men on the fighting front are risking their lives daily . . . and they don't punch time clocks.

Automotive production lines have been disrupted and are being converted into war production lines. Expensive heavy machines that didn't fit into the war effort have been stored, loaned or pushed out into the snow. We're starting to get planes and tanks and the volume will be pushed upward steadily. Guns and ships are coming through, along with shells, bombs, etc.

What we must have is summarized by Chairman Donald M. Nelson of the War Production Board: — 1—Increased production from plants and machines now producing war goods; 2 — Military production from factories and machines now producing civilian goods; 3—Increased sub-contracting and pooling of manufacturing facilities.

We must dismiss the smug idea that this war is "in the bag." We've got to win it by hard fighting. hard work and giving up some of our accustomed luxuries and diversions for the duration.

Wesley G. Paulson

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Featured In This Issue

SURFACE GRINDERS — by Francis A. Westbrook, M. E., summarizes highlights in the development of these important tools. Due to the number of machines and manufacturers in this field, it is necessary to run the story in two parts and the second installment will appear next month. See page 41.

FITTING YOUTH for Jobs in the Machine Industry is by Aubrey Williams, National NYA Administrator. He tells some of the things that are being done to develop mechanical skill and recruit capable machine operators from the rising generation on page 69

SHAPED DIAMOND TOOLS is by Paul Grodzinski, an English Consulting Engineer and authority on the use of industrial diamonds. He stresses the importance of using diamond tools designed for the job. See page.....79

THE HUMAN FACTOR in Morale Building introduces a new Contributing Editor—Edmund Mottershead, Dean of the American Institute of Human Relations. He discusses vital problems related to our war effort, with constructive hints on building shop morale. He invites reader comment so send in your problems for discussion in future articles. See page 95

FLUORESCENT LIGHTING MAINTENANCE is timely because of the wide adoption of these efficient new lighting units in our war production industries. E. W. Beggs, of the Westinghouse Lamp Division presented this data at the recent Winter Convention of the American Institute of Electrical Engineers. See page 111

CARBIDE DRAWING DIES is by James R. Longwell, Chief Engineer, Carboloy Co., Inc., and outlines the widening scope of uses in war production. See page 123

ELECTRIC DRIVES for Wide Speed Range is by G. A. Caldwell of the Industrial Engineering Dept., and W. H. Formhals, of the Motor Engineering Dept., Westinghouse Electric & Mfg. Co. It describes a drive combination offering a speed range of 120:1 that can be used effectively in many industries to simplify mechanical designs of machines. See page 135

CONSERVING WELDING ELECTRODES is by Clayton B. Herrick, Welding Engineer, Lincoln Electric Co., Cleveland. It points out many ways in which electrodes may be saved—and is timely in view of the widespread use of arc welding in our war production. See page 143

"LET'S TALK SHOP" offers a number of items of general shop interest, starting off with "Extending Broach Life" by Harry Gotberg, Chief Engineer, Colonial Broach Co., Detroit. See section commencing on page 157

TOOLING UP FOR VICTORY is the new heading under which you'll find the monthly array of new machine tools and new items of shop equipment for use in preparing to beat the axis. Section commences on page 191

PLANTS FOR SUB - CONTRACT WORK lists a number of new plants with facilities available for war production on page 300

MECHANICS THROUGH THE AGES is The Blue Book's monthly picture page 258

"KEEP 'EM FLYING" BUY U. S. DEFENSE BONDS

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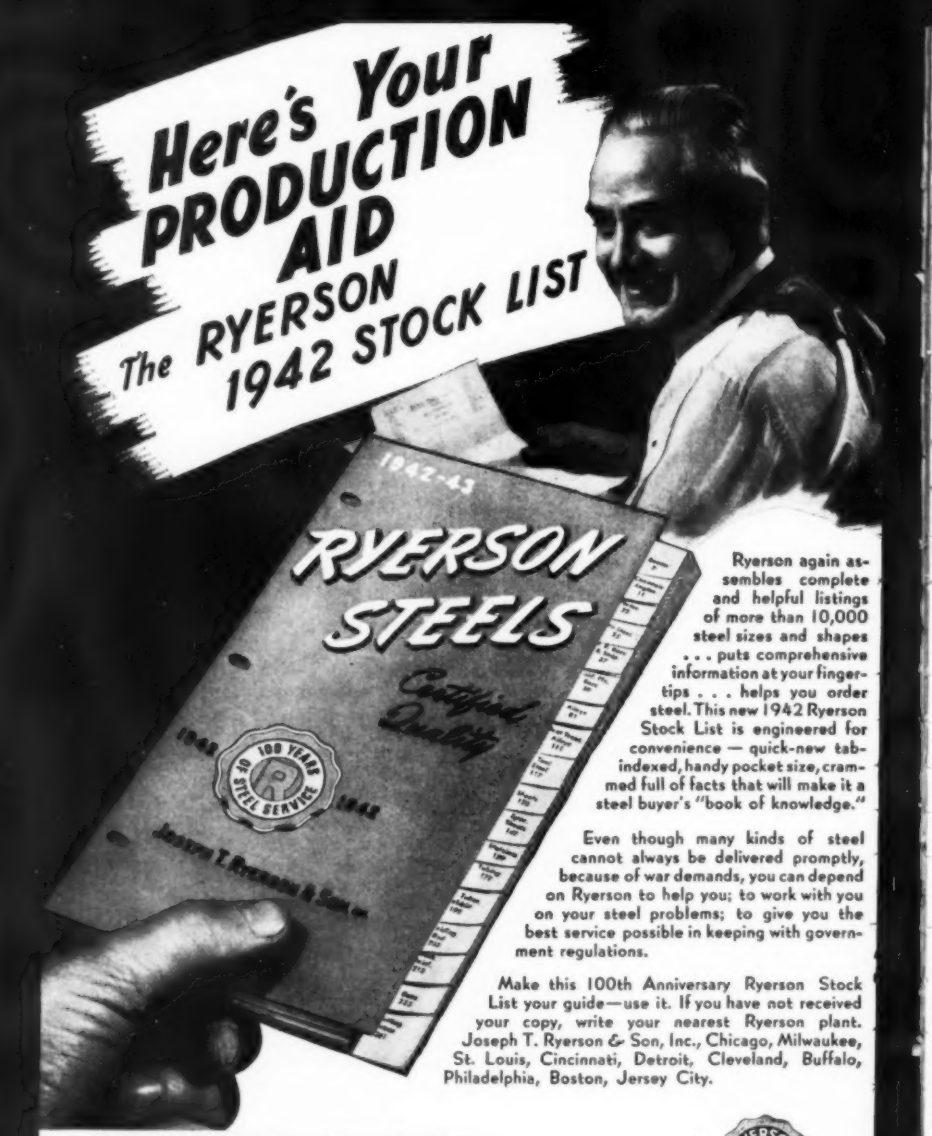
The RYERSON 1942 STOCK LIST



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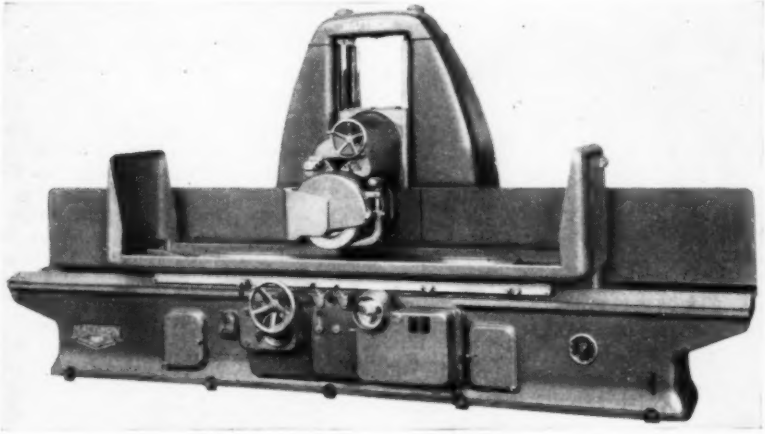
Highlights in Surface Grinder Development

(In two Parts—Part I)

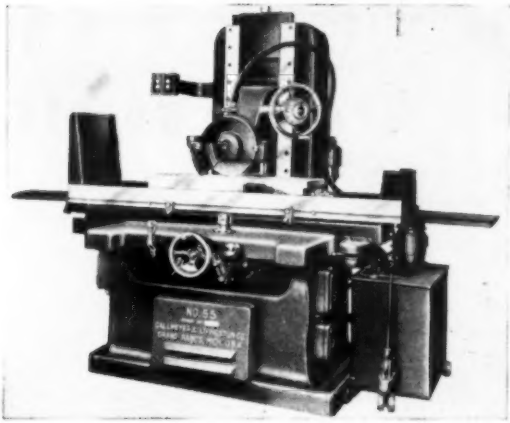
By FRANCIS A. WESTBROOK, M. E.

NOW that surface grinding is being used for the precision machining of both large and small work on a production basis, as well as for all kinds of special applications, it is interesting to review the development of the various makes and types of surface grinders now being built. A brief resumé of the progressive steps of development which have made them economical and fast for rough and precision finish grinding, both often without removal of the work from the grinder, will, it is felt, be opportune at this time when fast and economical production are of such vital importance.

In order to find out what has been happening in this branch of the machine tool industry, an effort has been made to contact all of the builders of surface grinders with a view of outlining the high spots of the developments which they have made during the last 20 years or so. The response has been extremely gratifying, especially when you consider the pressure all machine tool builders are under at the present time. The spread of surface grinding as a machining operation has been so rapid that numerous new builders of this type of tool have entered the field during the last few



A large size heavy duty Mattison Precision Surface Grinder.



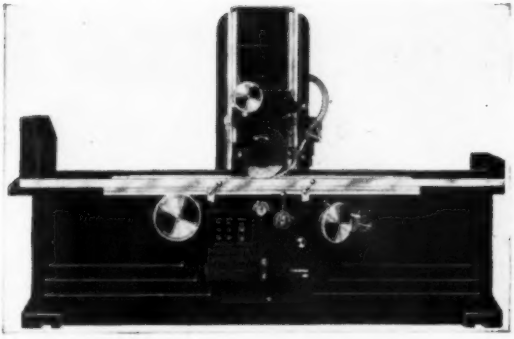
A Model No. 55 Gallmeyer & Livingston (Grand Rapids) Surface Grinder of 12"x17"x36" capacity.

years, while others have been building them for over 30 years, which of course is understandable and does not necessarily have a bearing on the quality or performance of the product.

In the present war emergency, reliability, speed of production, accuracy of work and economy are naturally of the greatest importance. Versatility is another general attribute which has been developed. This is logical on account of the great increase in variety of work which it is now advantageous to machine by surface grinding. This development has taken place and, in addition, different types of machines have been designed for the more efficient performance of specific types of work.

Vertical head adjustment featured on Gallmeyer & Livingston Surface Grinders for precision control.

As an example of what has been done in the field, let's consider the products and accomplishments of some of the different manufacturers of surface grinders. The Gallmeyer & Livingston Co., of Grand Rapids, Mich., have been in this business for something like 35 years. During that time, many developments have taken place. Hydraulic feed developments commenced about 15 years ago, and the perfecting of this type of surface grinder has been going on ever since. This Company pioneered in such developments and believes it was one of the first to standardize on machines equipped with separate motors for driving the grinding wheel spindle and the hydraulic mechanism. This development made it possible to eliminate the annoying idler jack ar-



Model A Gallmeyer & Livingston (Grand Rapids) Cross Traveling Head Type Hydraulic Feed Surface Grinder.

rangement in conjunction with the spindle drive and to provide for two spindle speeds. The two speeds was a distinct advance, making it possible to reduce wheel costs by dressing wheels and running them at the proper speed. Two speeds are standard, therefore, on the Company's precision tool room type hydraulic feed surface grinders.

As pointed out by this builder, these new hydraulic feed machines remove stock much faster than the old mechanical feed machines because of the greatly increased table speeds provided. Obviously, wheel costs are important at such high speeds, so adequate provision for wheel dressing is a very practical consideration.

A patented vertical adjustment of the wheel head was an innovation with their first hydraulic feed machines.

Brown & Sharpe No. 5, 1935 Model Precision Surface Grinder.

Brown & Sharpe's latest 1941 Model with spindles for direct motorization unit.

This involved a large hand wheel for raising or lowering the head quickly to approximately the right position, and a smaller vernier dial in the center for the close, final adjustment. This Company also developed a portable motor-driven coolant system which makes it convenient for the operator to have clean coolant available at all times.

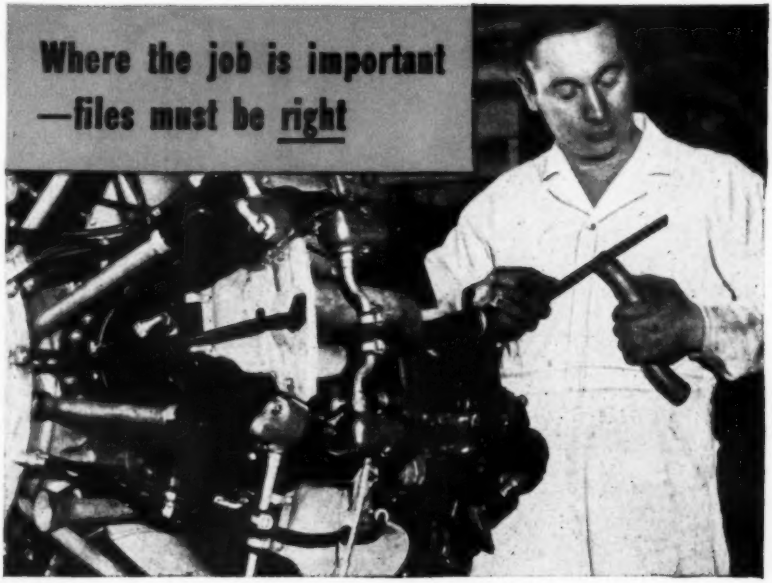
The Brown & Sharpe Mfg. Co., Providence, R. I., pretty well summarizes the high spots in their surface grinder developments as follows:—It was not until about 1925 that the surface grinder was first arranged for individual motor drive with a motor in the base. Relatively few changes were made after that for several years, except some improvements in guarding and a few structural changes for better operation. The latter included changes in the rear spindle bearings to provide for preloadage precision ball bearings to give improved grinding on slots and other work calling for axial precision.

In 1932 the same design of machine was offered to the trade with hand feeds only where certain requirements for tool shops did not demand machines with power feed. An important change was made in 1935 when the rate of table drive was increased from 11 ft. to 33 ft. per minute, and shock absorber mechanism was added to compensate for increased inertia. In the same year, a larger and heavier surface grinding machine was brought out. This was of the hydraulic type. Being of larger capacity and having greater power, it was intended for both tool room and production grinding. Illustrations show the 1917 and the later models. Comparison of these two photographs will tell a considerable story.

The 1935 model had, briefly, a horizontal spindle of the unit type with plain or ball bearings, reciprocating table, mechanical and manual feeds, automatic feeds.

In contrast, here is Brown & Sharpe's 1917 Model No. 2.

Where the job is important —files must be right



For Victory, America's war effort must be *efficient* as well as huge. In engines, aircraft, guns, shells, precision instruments, for example, not a single detail must be left to chance.

High standards of workmanship—in *any* industry—demand the right tool, as well as the right man, for the job. In a file it means one that is *correct* in design and size for the kind of metal, shape or part on which it is used; for the amount of metal to be removed and the finish to be attained.

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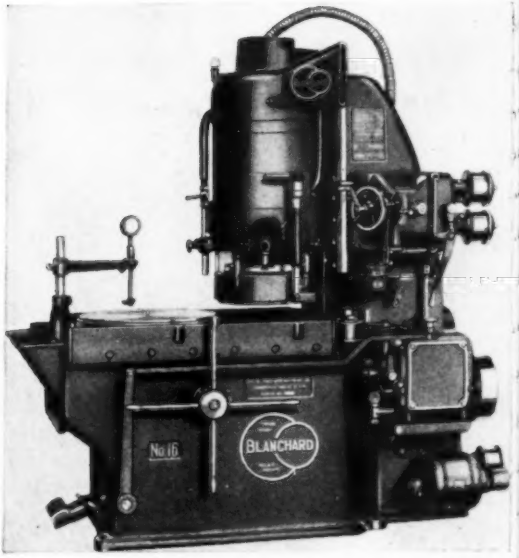


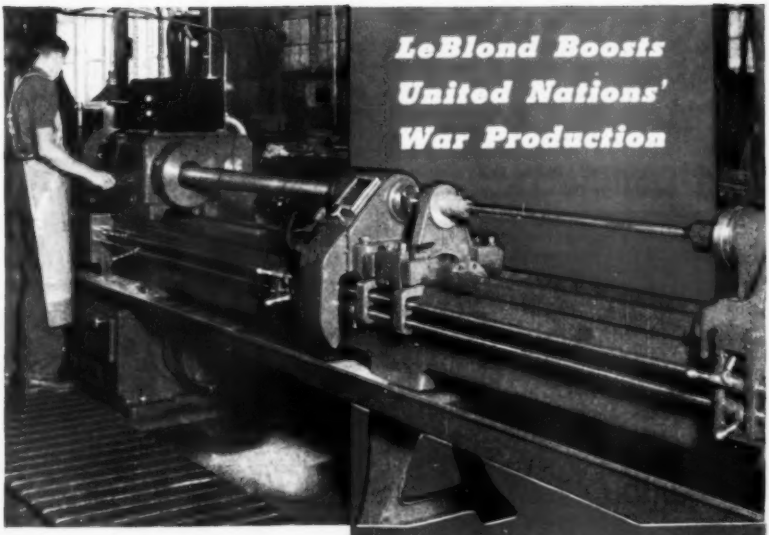
Here is the old Model No. 16 Blanchard Surface Grinder which should be compared with the latest Model 18 Blanchard on the following page.

In 1941, a most important change was made in connection with the spindle whereby the removable-unit type was employed for easier replacement and quicker changing of the endless driving belts. Spindles were offered in both plain-bearing and anti-friction units, the plain bearing type being designed for the so-called oil-kerosene mixture lubrication. A further addition was made in offering the spindles for drive by direct motorization units.

This outline of development is more or less typical of the developments which have been made by the surface grinder builders who have been in the business for a long time. However, it should be pointed out again that all along as new lots were developed, smaller changes were made, such as in the methods of guarding, graduations and mechanical construction, improved belt drives, safety and control devices, etc. Other builders, who came into the field at a later date naturally started farther along in the line of development.

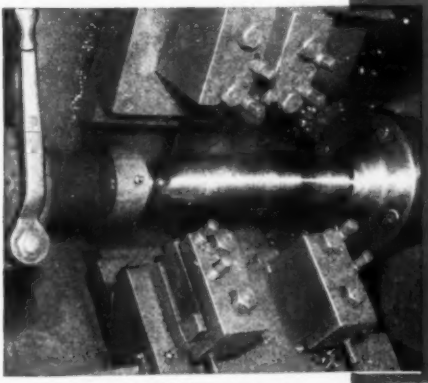
However, this is by no means the whole story for there are other types of surface grinders including those of very large size, rotary grinders, etc.

The Blanchard rotary grinder has also undergone radical changes. The Blanchard Machine Co., Cambridge, Mass., has submitted two very interesting pictures, one showing the old model, No. 16, and the other of the latest model, the No. 18. The difference in appearance easily indicates the outline of developments which this Company has made. As set forth in this outline of highlights, compared with the No. 16, the No. 18 grinder is much more rigid, due to increase in the dimensions of column and base and the improved wheel head, cast in one piece with bearings and shell type motor mounted in bores that are finished



LeBlond Boosts United Nations' War Production

In action somewhere in Canada: (above) No. 2 Gun Boring Machine; (below) 12" Automatic Lathe.



In two of Canada's important munitions plants, LeBlond Lathes are performing some of the most accurate machining operations required in producing equipment for the defense of an Empire. Boring and rifling Bofors anti-aircraft gun barrels, rough and finish turning 25-pounder shells, are jobs that reveal the high productive capacity and unvarying accuracy of LeBlond machine tools.

Already proved in munitions manufacture in Canada and in the United States, LeBlond Lathes are ready to contribute rapid, precision operation to every defense job within their power.

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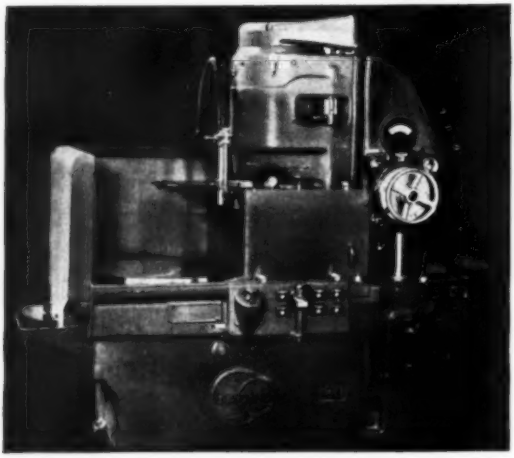
at the same setting. The older wheel head was built up to the extent that it had a separate upper bearing box bolted to the upper part of the head, and the motor did not fit a bore in the head, but was bolted down at its lower end, and centered by adjusting screws. The new wheel head also has the slide reversed from the old design, as shown in the photograph. The head slides enclose those of the column and have a narrow guide, instead of guiding by entire width of the slide.

Other improvements noted by this builder include a lower magnetic chuck surface in relation to the floor to make it easier to handle heavy work; water guards open at the front, close to the operator's position and an improved feed for the head. This employs a large graduated dial, easy to reset for stopping automatic feed at the desired point. Feed and power raising and lowering controls are on one lever, interlocking the motion and providing very quick and easy operation when stopping the down feed, and engaging the rapid raising motion.

Complete electrification, as is the modern practice, and one of the outstanding developments of recent years, has been accomplished by driving all motions with individual motors, of which there are five respectively for the wheel, chuck rotation, chuck traverse, rapid raising and lowering of the head, and the coolant pump. There are no belts or chains in these drives, each motor being directly coupled to its load. These machines, like so many other machine tools of many makes, are now operating 24 hours per day right along, at high rates of production and with maintained accuracy and satisfaction.

The Thompson Grinder Co., Springfield, Ohio has presented a very interesting comparison between their surface grinders built in 1930 and 1941 in the form of parallel columns which summarize the changes and suggests the expanding field of surface grinding.

These machines have a table feed of 100 ft. per min. which permits the use of hard wheels and makes possible the production of finishes that were form-



This is the latest Blanchard Model 18, showing numerous improvements and advances when contrasted with the old Model 16 Blanchard on the preceding page.

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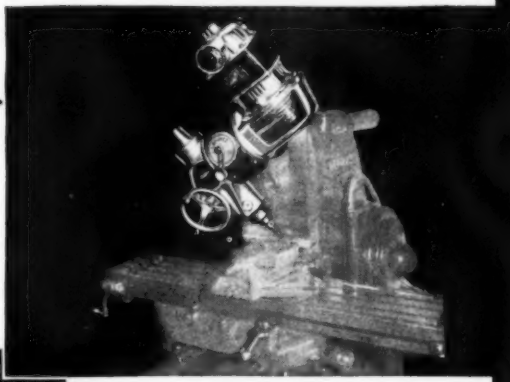

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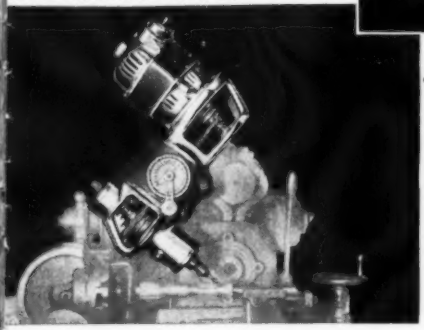

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A compact, well-balanced attachment adaptable to any and all types of milling machines.

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Send for bulletin, describing the Milwaukee Midgetmill and Speedmill—their many advantages in end mill operations.

The Midgetmill and Speedmill were formerly produced and sold under the name of DALRAE by the DALRAE TOOLS CO., Syracuse, New York.

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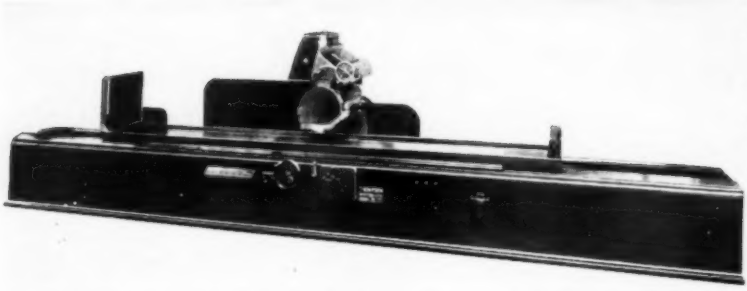

Thompson Surface Way Grinder used for finishing hardened ways to within .0002" by a prominent turret lathe builder.

erly more expensive. The use of hydraulic drive for the rapid traverse of the wheel head is controlled by the cross feed lever and greatly assists the operator in placing the wheel head. It is advantageous in automatic wheel truing. The simplification and grouping of the control panel makes it possible to use operators with limited machine experience, which is of particular importance at this time when so many new and comparatively inexperienced men must be pressed into service. This feature applies to numerous makes of surface grinders and constitutes one of the important modern developments.

In the table, it is worth noting that in 1930 this Company made one model and in 1941, 47 different types This furnishes remarkable evidence of the spread of surface grinding as a recognized machining operation. The illustration of the Thompson surface grinder is of the latest model type C, 20x16x192 way grinder, which is used by, among others, a prominent builder of turret lathes for finishing hardened ways to within .0002". This will illustrate the close tolerances nowadays required.

As is the case with so many of the builders of surface grinders, the Hanchett Mfg. Co., Big Rapids, Mich., makes a number of different types of grinders designed to cover the continually increasing variety of applications. That is, there are vertical spindle rotary and reciprocating grinders, traveling wheel and traveling table face grinders, piano cylinder wheel and straight wheel surface grinders, vertical spindle, single and double spindle disc grinders, automatic single wheel grinders and swing arm grinders. The last has been used for numerous rather unusual jobs, such for instance as grinding the inside and outside diameters of cylindrical work. The illustration shows a rotary type surface

	1930	1941
1. Spindle power	5 h.p.	15-30 h.p.
2. Grinding wheel	10x3x5	20x3x8 to 20x6x12
3. Net weight of machine, lbs.	7000	11,500
4. Simplified control	Lever and handwheel for both	
5. Extension of sizes	1 machine	47 machines
6. Wheel truing	Not provided	Automatic
7. Electrical elevating	Not provided	Standard
8. Hardened cross slide	Not provided	Standard
9. Neoprene wipers	Not provided	Standard
10. Automatic down feeds	Not provided	Optional
11. Pressure lubrication of spindle	Not provided	Optional
12. Electric form truing	Not provided	Optional

Special machine performs four successive operations on 28 valve guide holes in airplane crankcases. For jobs like this, tools of MO-MAX Steel are the logical choice.

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Molybdenum-Tungsten High Speed Steel

". . . makes tools 20% more efficient, speeds production, lowers cost. MO-MAX, original MOLY high speed steel, standardized on the basis of its nine-year distinguished service record in widest variety of applications, is obtainable from the fourteen independent sources listed below.

"LMW"	Allegheny Ludlum Steel Co.	"Molite 8"	Columbia Tool Steel Company	"Tatmo"	Latrobe Electric Steel Co.
"Mohican"	Atlas Steels, Ltd.	"Rex-T-Mo"	Crucible Steel Co. of America	"S.T.M."	Simonds Saw and Steel Co.
"Bethlehem HM"	Bethlehem Steel Company	"Di-Mol"	Henry Disston & Sons, Inc.	"Mo-Tung"	Universal-Cyclops Steel Corp.
"Mo-Cut"	Braeburn Alloy Steel Corp.	"Rex-T-Mo"	Halcomb Steel Co.	"Vul-Mo"	Vulcan Crucible Steel Co.
"Star Max"	Carpenter Steel Co.	"Moqui"	Jessop Steel Company		

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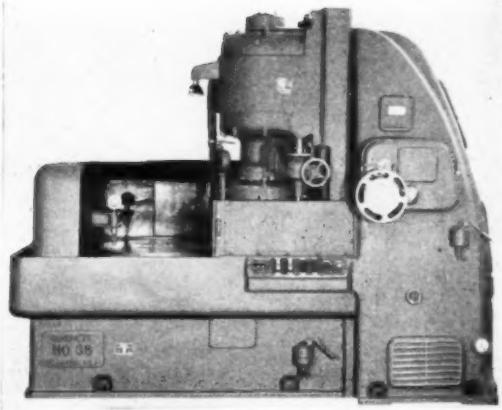


A modern Hanchett Rotary Type Surface Grinder, weighing 21,000 lbs.

grinder which weighs 21,000 lbs. These many types are designed to do many different kinds of work efficiently and with maximum speed.

This Company as well as many others, report that, generally speaking, they have, during the last 20 years, added greatly to the weight and rigidity of all of their machines. In many instances, machines of the same capacity have been doubled in weight by reason of larger dimensions, more ribs, greater wall thicknesses, etc. On practically all of the machines with reciprocating tables, formerly using bull gears and racks, the latter have been replaced with two-cylinder hydraulic mechanisms. This was done about 10 years ago. Spindles have been progressively made of better grades of steel and of larger diameters. All are now mounted in precision bearings with improved means of lubrication and with spindle assemblies are accurately balanced. Precision bearings of the pre-loaded type meet the problem of end thrust.

All of the Hanchett units are arranged for wet grinding and have greater coolant capacities than formerly. In fact, this company reports that it encounters few dry grinding jobs nowadays. Other developments which have taken place consist of automatic sizing devices, some of which automatically compensate for wheel wear, greatly expanded electrical controls and the use of more segmental grinding wheels in place of the continuous cylinder wheels. Twenty years ago they worked to tolerances of .001 to .03", but now the tolerances are only .0005, or less

As is well known, and already been brought out in this review, the developments mentioned have by no means all been made exclusively by the firms reporting them. The use of hydraulic drives, more and more electrical controls, working to much closer tolerances, increased speed greater rigidity, etc., are almost universal accomplishments in the field.

Williams, White & Co., Moline, Ill., building the Osterholm grinder, has developed two machines which are interesting in several respects. One of them is an automatic surface grinder design for production in grinding finished surfaces on rough castings in a

It's development--or envelopment

I thought this field trip was to preview tomorrow's world *of welding—but look what's happening* today.

ALTER EGO: It may be tomorrow to you but I'm afraid it's yesterday to these people. Here they've completely shield-arc welded a building in the shop—toted it to location on a shield-arc welded truck-trailer—dropped it to the foundation with a shield-arc welded tractor crane.

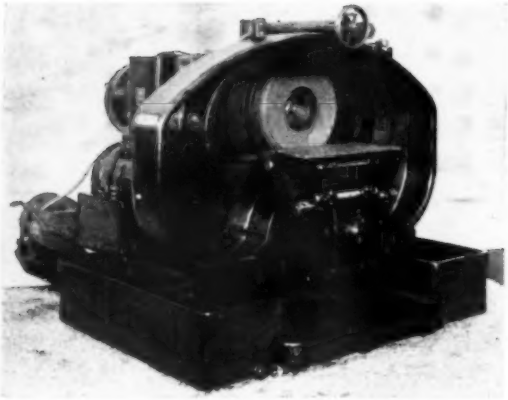
And here I am worrying about whether it's time for us to consider arc welding for some of our simpler designs.

ALTER EGO: Well, this company started with welding. Found it worked, developed a stride. Now they're leaders in their field—largely because they use welded construction 100%.

And, as they say, "The result is a lighter, stronger product — be it machine, building, ship or what have you — a design that can be more easily and quickly changed for improvements." *No wonder they've kept their products away from any enveloping movement. Their flanks won't be blitzed in the Battle for Business a few years hence. So much for them—but how about* us— *how can we get similar results for our products?*

ALTER EGO: Wouldn't it be well for us to ask The Lincoln Electric Company, Cleveland, Ohio, for their Machine Design Studies to get practical pointers on change-over to welding?

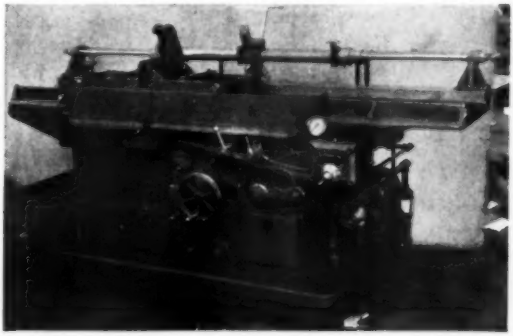
ALTER EGO: Literally, "one's other self"—the still, small voice that questions, inspires and corrects our conscious action.



An Osterholm (Williams & White) Production Grinder for finishing surfaces of rough castings in one operation.

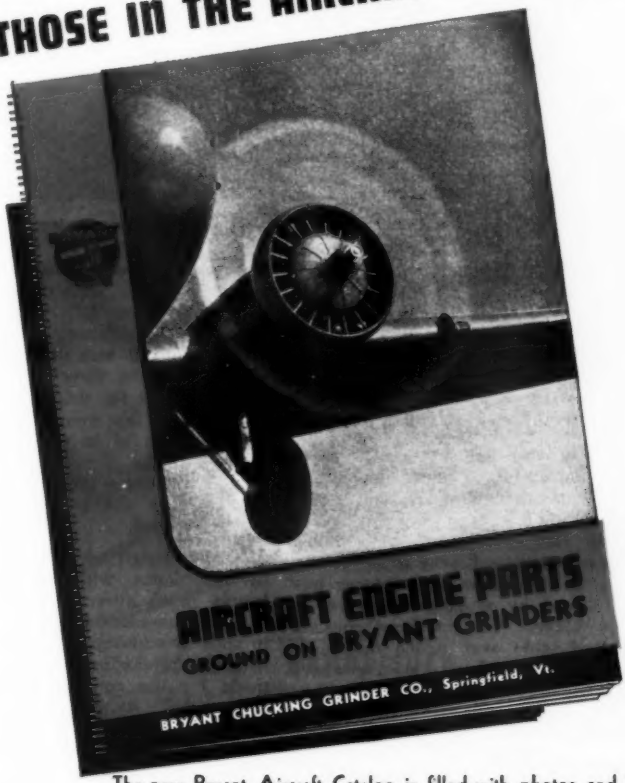
single operation. It is used extensively on automotive parts such as gear cases, manifolds, rear axle housings, etc. This machine, as its name implies, is automatic. In the loading position, the table is inclined so the fixture may be loaded easily. After the work has been clamped in the fixture, the operator presses a button and the table immediately rises to a horizontal position, bringing the piece to be ground into position in front of the wheel. The table then starts oscillating back and forth in front of the wheel which is automatically fed in to the required depth. The wheel then retreats, the table ceases to oscillate and drops back to the loading position and the machine comes to a stop automatically. The wheel feeds toward the work at a pre-determined rate and water is applied to its surface through a hollow spindle.

The Osterholm horizontal grinder mentioned is designed for production or tool room grinding without elaborate fixturing. Although the work ordinarily moves across the feed table to the wheel, this machine is versatile enough to provide for the arrangement shown in the illustration whereby the



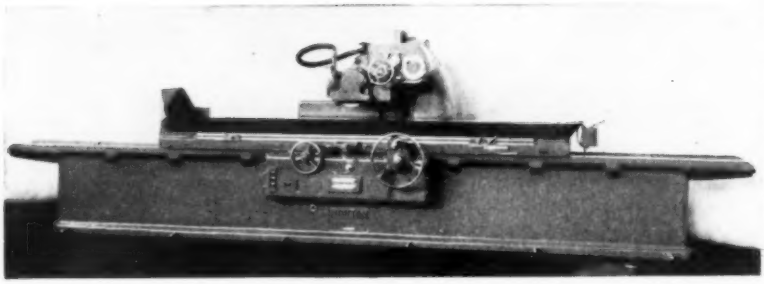
Osterholm (Williams & White) Horizontal Surface Grinder designed for use without elaborate fixturing.

FOR THOSE IN THE AIRCRAFT INDUSTRY



The new Bryant Aircraft Catalog is filled with photos and line drawings showing Bryant Internal Grinders used in the production of aircraft engine parts. It also shows how the Bryant feature of single slide and three point control assists in meeting the exacting requirements of the Aircraft Industry in its National Defense Program. A request on your company letterhead will bring your copy without obligation. Just write—

BRYANT CHUCKING GRINDER CO., Springfield, Vermont



A 96" length Norton Precision Surface Grinder which reveals many advanced features.

work is locked in position and is suspended from rails above the wheel. It is prevented from rising by means of these rails, and the wheel is adjusted upwards to remove the required amount of metal. The fixture is oscillated across the top of the wheel by means of an hydraulically actuated mechanism.

This horizontal grinder employs a principle similar that of the wood working jointer and is capable of grinding flat surfaces at high rates. The work is passed over a wheel revolving in the table, flat surfaces being obtained by moving the work in a true plane. The machine consists of a feed table over which the work passes to the wheel, an abrasive wheel with a stationary center plate within the wheel and a take-off table. The surfaces of all of these parts are parallel.

One of the illustrations shows 12" grinder of the latest model, which is 96" long. It is made by the Norton Co., Worcester, Mass. The longest standard length is 72" but the longer one is entirely practicable. This new model was announced only two years ago and the causes for its development are interesting as typical of the expansion of grinding operations. Until the advent of this 12" machine, Norton built two sizes of surface grinders, viz., a small 6x18" machine and a somewhat larger 10" model. Twenty years ago the company did build a 15" machine but it was discontinued 8 or 10 years ago as there was not a sufficient market for this size. But during the past few years, precision surface grinders of larger capacity have come into the picture and are being used for larger work, more and more. Consequently the larger 12" machine was developed.

In the design of this machine, and in accordance with general modern trends, much attention has been given to the convenient location of controls, in spite of additional cost, as this helps to speed production. Provision is also made for the convenient variation of table speed. Another time saver is up and down adjustment of the standard diamond tool holder to accommodate it to work of different heights. It eliminates the need of lowering the wheel for truing and then raising it again. Another interesting feature is the manner in which coolant is delivered. The nozzle arrangement is such that when the wheel cover is swung open, the nozzle moves out of the way and does not interfere with changing the wheel. There is also a convenient nozzle adjustment for directing the coolant as desired.

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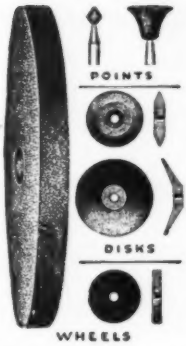
CROSS-CUT BURS

FINISHING BURS

S·S·White PRODUCTION BOOSTERS

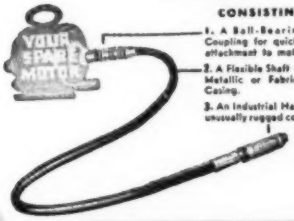
Accurately made, expertly hardened and sharpened. Cut fast and clean and hold cutting edges for long periods. Only a few of the types and head shapes are shown

ABRASIVE TOOLS



Super-quality in materials and construction, these tools run true, cut faster, wear evenly. Available in abrasives for hard and soft materials. Wide range of shapes and sizes.

FLEXARMS



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One of these FLEXARMS on your spare motor makes a handy portable tool for die-sinking, drilling, boring, reaming, grinding, rotary filing, polishing and many other operations. FLEX-ARMS are made in several sizes for light and heavy work.

INDUSTRIAL HANDPIECES

Finest quality handpieces in types for light and heavy work on flexible shaft driven tools.

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FOR AIRCRAFT

ANTI-AIRCRAFT GUNS

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PROMPT DELIVERIES

ACCESSORIES

THREADING AND FORMING TOOL HOLDERS.

A Universal tool holder that can be used for fine or coarse threading without danger of chatter or tool marks.

Forming tools inserted in this holder produce work of uniformly high quality with more pieces per grind and fewer rejects.

Furnished with hardened wrench and one high speed cutter.

Write For New Folder Today.

WELL ADAPTED FOR USE IN AIRCRAFT, ARMAMENT AND ACCESSORY PLANTS

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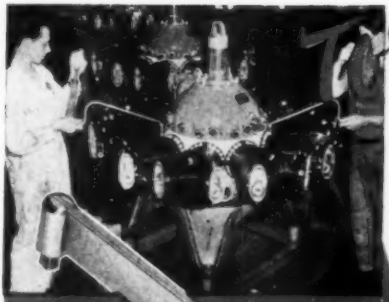
It is not intended to imply that the advantageous developments of this machine with respect to convenience, etc., have not been met in whole or in part by all of the other builders. It is simply that the developments have taken place in such a manner and the facts related to them are so clear that this has been used more or less as an easily followed example. While space liminations do not permit of going into as many details as might seem desirable, a few more will be given.

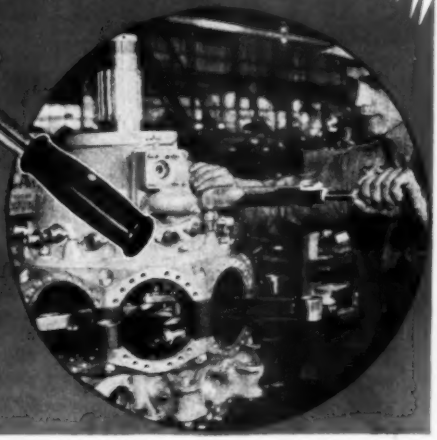
Thus, an interesting point is that the weight of the wheel slide is some 1200 lbs., without the motor or wheel spindle and wheel. The spindle bearings are automatically flood lubricated. Vibration from the pumps and pump motors is isolated by mounting both on coiled springs. One motor drives two pumps. Pressure from both is used to traverse the table but during reversal, the pressure from one operates the cross slide and the other reverses the table. The theory back of this, which has worked out well, is that all the pressure is not needed during table reversals but that considerable pressure must be provided to move, in a fraction of a second, the very heavy wheel slide. The arrangement permits the use of a smaller pump drive motor. Heating of the machine, with possible impairment of its accuracy, due to the heating of oil discharging under high pressure through a relief valve while the table is stopped in the loading position, is provided for by a venting arrangement which reduces the oil pressure to zero. This is felt to be particularly important for surface grinders which are likely to be stopped while loading for periods greater than the grinding time.

The guards over the table ways are interesting. They consist of steel ribbons fastened to the end of the base and are then threaded through rollers so that as the table traverses, they run



Torque Wrench

NO FRICTION ADJUSTMENTS MOVING PARTS FRAGILE MECHANISMS



Vital defense plants depend on STURTEVANT TORQUE WRENCHES. Where speed and accuracy are essential TORQUE WRENCHES solve the problem — economically. Wire, write or phone for prompt attention.

PIONEER MANUFACTURERS OF ACCURATE MEASURING WRENCHES

P. A. STURTEVANT CO.
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ANNOUNCING
A NEW, FAST
KIPP
air
GRINDER

The
MODEL H

- HANDIER GRIP
- MORE POWER
- 50,000 R. P. M.

Madison-Kipp tool-makers originated the first really high speed grinder. They know a great deal about the practical side of grinder design and grinder usage. They think the new Model H is the best all around off-hand tool they have ever tried and we are sure you will agree with them.

Order Today! ONLY $29.75

Please attach preference rating certificate number with order

MADISON-KIPP CORPORATION
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back and forth through the rollers. This protects the ways with the table in any position, and the base is not extended unnecessarily. All points in the machine calling for daily lubrication are provided for automatically. Motor bearings and the previously mentioned rollers require lubrication about every week or 10 days and are serviced by the operator.

Mattison Machine Works, Rockford, Ill., is another prominent builder of a broad line of surface grinders in high powered large sizes (12" to 36") featuring hydraulic feeds. This Company stresses versatility for grinding on a production basis. In addition to the profitable handling of the regular flat work, these machines are offered for a wide range of unusual grinding work. For example, many large sizes of castings are now being ground to fine finish and extreme accuracy that were previously hand scraped. V-type and flat ways, as well as contour work can be ground also with wheels dressed to the proper angle or radius. The makers point out that the wheel clearance and spindle construction facilitate the handling of shoulder and edge work. In many cases multiple punching dies may be resurfaced without removing leader pins. It is also emphasized that the rigid spindle mounting assists on interrupted surfaces in holding to closer limits of accuracy. Bronze, lead and various other metals can be ground.

From the illustration of this grinder, it will be observed that it has massive double column supports and substantial ribbed base construction to assure rigidity under the heavy stresses incurred with rapid removal of stock. Also to sustain accuracy.

Controls are centralized within easy reach. The powerful motors are built-in. Rotors are dynamically and electrically balanced, and mounted directly on wheel spindles. Wheels are dressed hydraulically by movement of wheel

VAN NORMAN RAM TYPE UNIVERSALS

Help to Speed Curtiss-Wright's Milling Work

In the Buffalo plant of the Curtiss-Wright Corporation, No. 26 Ram Type Universals keep toolroom milling output up to top levels, day in and day out. For this uniquely adaptable machine accommodates the work of several single-purpose machines . . . takes any number of successive cuts from horizontal to vertical, without resetting the work on the 50" x 12" table. Operator finishes one cut, then quickly swings the cutterhead into position for the next cut, thus avoiding many chances for errors. And what is more, he ends the day far less fatigued and with far more work to his credit.

New men can turn out good work right from the start, with this easily operated No. 26 which provides front and rear directional controls of power feeds . . . 6-way rapid traverse of table, knee and saddle . . . extra-large dials for easy, accurate reading. The No. 26 is modern, rigid, fast, built to maintain unvarying accuracy. Write for complete information on this modern milling machine.

VAN NORMAN MACHINE TOOL COMPANY, SPRINGFIELD, MASSACHUSETTS

A No. 3B Horizontal Spindle Automatic (Mechanical) and Hand Feed Surface Grinder made by the Abrasive Machine Tool Co.

slide. Electrical switches and connections are protectively enclosed in base. A one-shot lubrication system is provided, for ways of vertical slide and control mechanism in the vertical slide. Table ways are automatically lubricated with filtered oil. Coolant is carried in a portable tank on outside of base.

These machines are being used on such jobs as finishing ways of flame hardened lathe beds, heavy heading slides, lathe carriages and for multiple grinding operations on gangs of parts.

The Abrasive Machine Tool Co., East Providence, R. I., has been a factor in the development of precision grinding machines. Pioneering in the use of one-piece castings for the frames of surface grinders, at an early date they corporated the motor-in-base construction as the standard arrangement for motor-driven machines. The cartridge type of spindle, wherein spindle and bearings are mounted in a separate unit which may be inserted or with-

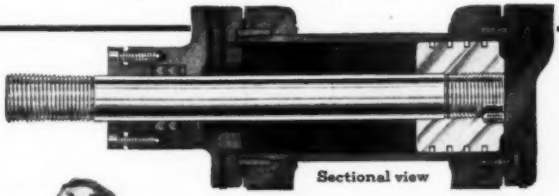
DIAMOND ACME TOOLS

Diamonds vary in quality and it is important to use the proper kind for a given job. "Bargain diamonds" are not an economy.

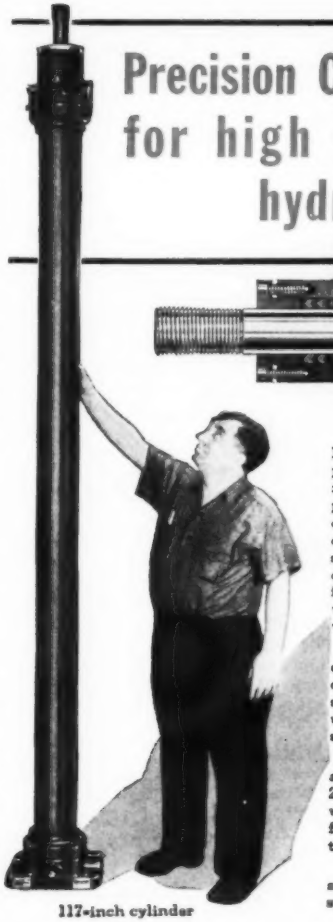
If you don't know diamonds know your diamond dealer. Our 45 years in this field merits your confidence.

ACME DIAMOND TOOL CO.
15 MAIDEN LANE, NEW YORK, N. Y.

Precision Cylinder Construction for high efficiency use of hydraulic power



Sectional view



117-inch cylinder

Hannifin Hydraulic Cylinders provide a stronger, simpler design and precision construction that assures maximum utilization of the advantages of hydraulic power. Patented no-tie-rod design eliminates a source of leakage and allows removal of end caps without collapse of other parts. Mirror-finish honing (in all sizes) produces a straight, round, perfectly smooth cylinder bore for efficient piston seal and minimum fluid slip. End caps may be positioned independently, with inlet port at top, bottom, or either side, for convenience in installation.

Hannifin precision methods provide uniform high quality construction and finish in all sizes, even in cylinders as large as 22 feet long. High efficiency piston seal, minimum fluid slip, long life, and maximum usable power are the logical results of Hannifin construction features.

Hannifin hydraulic cylinders are built in seven standard mounting types, with small diameter piston rod, 2 to 1 differential piston rod, or double end piston rod, with or without cushion. All sizes, any length of stroke, for working pressures up to 1000 and 1500 psi. Special types built to order.

Investigate the advantages of Hannifin Cylinder construction. Write for Bulletin 35-H with complete specifications.

HANNIFIN MANUFACTURING COMPANY

621-631 South Kolmar Avenue • Chicago, Illinois

HANNIFIN HYDRAULIC CYLINDERS

drawn readily from the wheelhead, while not a new idea, has been developed by this Company for the benefit of its customers. By using this construction, it is possible to ship immediately upon receipt of a telegram or telephone call, a new spindle cartridge complete, and the original may be returned for inspection and repair. This saves the user the difficulty of adjusting spindle bearings, a job for a skilled mechanic of which there are now all too few in the various factories.

Another noteworthy item with regard to this Company's products is the fact that the spindle is driven from a motor in the base by means of an endless flat belt without the use of spring, counter-weight or similar contrivance, and yet the belt tension remains the same regardless of the position of the wheelhead. A pressure oiling system (Bijur Lubricating Corp.) lubricates all parts of the machine shown, except the spindle, at a pressure of 3 to 7 lbs.

Numerous attachments and special features are provided such as an exhauster attachment, motorized dust exhauster, cup wheel head, multiple wheel head, wet grinding attachment, etc.

(Part II illustrating and describing many additional types of surface grinders will appear in an early issue.)

MILFORD PROFILE SAW
(The blade for all internal - external metal cutting)
HANGS THIS SIGN ON YOUR BASIC MACHINE TOOLS

Use a contour sawing machine, or any vertical, metal-cutting band saw machine equipped with Milford Profile Saw, for odd jobs of parts, special tools, dies, jigs, etc. You will make them to better advantage.

Milling machines, shapers, lathes, drill presses, or other production equipment, if used for such odd jobs — plays havoc with your schedules. MILFORD PROFILE SAW helps keep your basic machine tools doing straight production work.

You may have a band saw machine that can be adapted to Profile Sawing. If so, write us for directions. You will find it well worth while. Write for a free sample of Milford Profile Saw, giving specifications of blade you now use, or description of cutting job and machine.

A machine for contour sawing is no better than its saw. Milford Profile Saw is made, and guaranteed by the world's largest, most experienced producer of metal-cutting band saw. Carried in stock by Mill Supply Distributors in every locality.

THE HENRY G. THOMPSON & SON CO.
NEW HAVEN, CONNECTICUT

MILFORD
★ PROFILE SAW ★
Also makers of Rezistor Hacksaw Blades

TRICO OILERS
SAVE — TIME
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No guesswork—bearing failures—idle machine time or waste when you modernize with TRICO AUTOMATIC OILERS.
WRITE FOR BULLETINS
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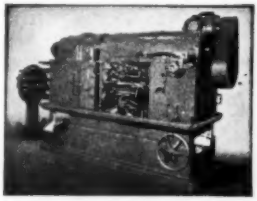
CONE—first again!

WITH THE DEVELOPMENT OF A HOLE BURNISHING ATTACHMENT FOR USE DURING THE AUTOMATIC CYCLE

Here is *another* CONE FIRST that offers new facilities for stepping up multiple-spindle production on present and future work.

Now holes may be burnished in gear blanks and similar parts during the automatic cycle of your Conomatics. Just think what this new Cone development means in dollars and cents savings—*no rehandling; no grinding; no loss of floor space, labor or motion!*

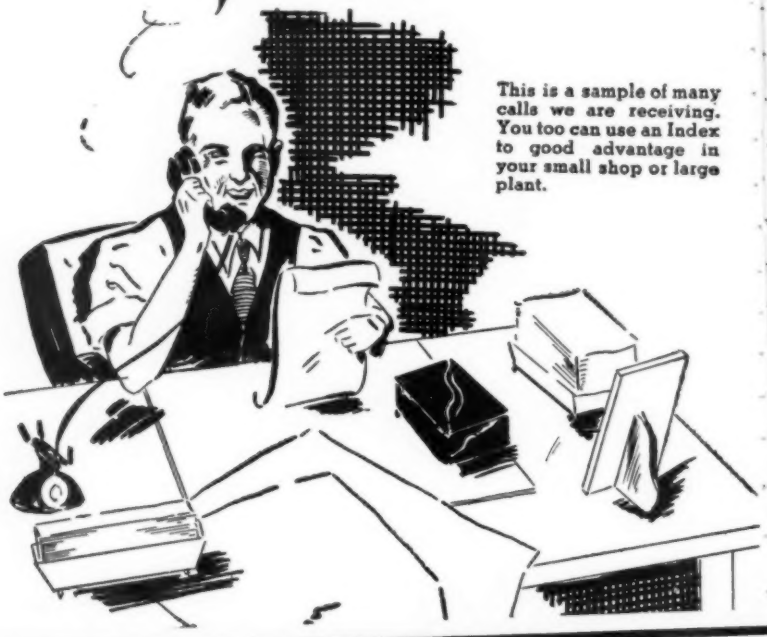
Now is the time for SPEED and more SPEED SPEED spells security. Now is the time to purchase wisely. Cone is always ready with a complete line of Conomatics and attachments which insure more SPEED and ECONOMY.



CONE AUTOMATIC MACHINE CO., INC.
Windsor, Vermont, U. S. A.

HELLO! "BLANK and BUXTON?"

"This is Defense Plant of U. S. City calling. Say!, that Index Mill you recently shipped us is a dandy. We certainly should have had one of those machines around here long ago, and would have if we had ever dreamed it was such a good machine. We have figured where we can use two and possibly three more machines to good advantage. How soon do you think we can get them?"



This is a sample of many calls we are receiving. You too can use an Index to good advantage in your small shop or large plant.

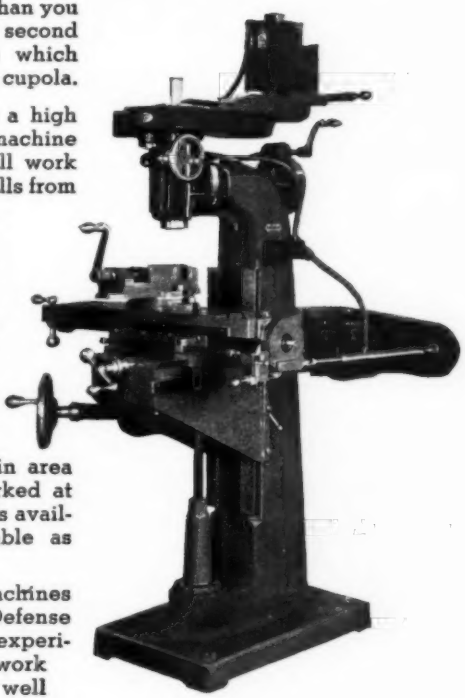
BLANK AND BUXTON

3100 E. MICHIGAN AVE.,

THINK OF THIS

A Jig Borer for less than you can get for your old second hand milling machine which should be thrown in the cupola.

The 40-H INDEX is a high speed vertical Milling machine designed to do end mill work with high speed end mills from ⅛" to ⅝" diameter. It is equipped with spindle travel making it handy for drilling, provided with speeds fast enough for milling with small end mills and slow enough for boring up to 3" holes in steel, equipped with verniers for locating. A jig or fixture 8"x16" in area by 12" high can be worked at one setting, power feeds available to spindle and table as extras.



Hundreds of these machines are now working in Defense Plants on tool, die, experimental and production work and doing the work so well that all users say it is the best machine of its kind on the market today. Let us tell you about it.

Write today for quotations.

MACHINERY CO.

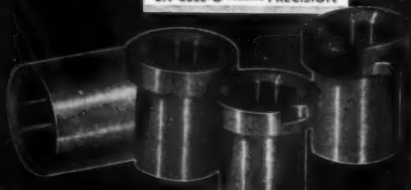
JACKSON, MICHIGAN

DRILL JIG BUSHINGS

PRECISION	✓	EX-CELL-O BUSHINGS are held to a high standard of accuracy.
VARIETY	✓	EX-CELL-O BUSHINGS are available in wide range of styles and sizes.
UNIFORMITY	✓	EX-CELL-O BUSHINGS all conform to A.S.A. STANDARD in every respect
ECONOMY	✓	EX-CELL-O BUSHING are made t stand up beyor the expecte

XLO

EX-CELL-O *means* PRECISION



EX-CELL-O

CORPORATION

DETROIT, MICH.

Fitting Youth for Jobs in the Machine Industry

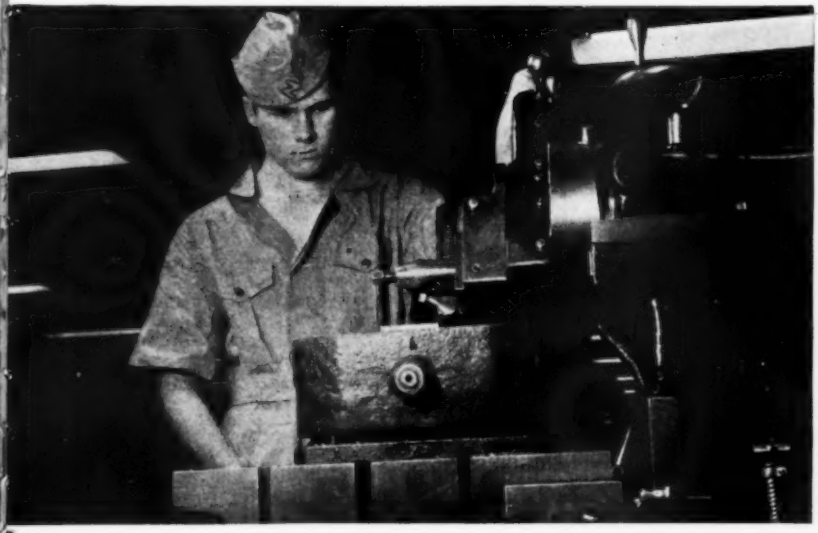
By AUBREY WILLIAMS, National NYA Administrator

TO THE machine manufacturer, faced with the problem of finding experienced and trained workers to turn out the increasing number of orders which are called for in the 56 billion dollar war production program, an important but little publicized agency of the federal government may help provide the solution. This agency, which in 1941 alone sent more than 16,000 trained and experienced workers into the machinery industry, is the National Youth Administration.

In 4,295 workshops scattered over the entire nation young men and women are being given basic work experience and training in preparation for jobs in private industry. Practical experience is being given in such jobs as lathe operation, operating drill presses, forging, foundry work, welding, riveting, electrical work and other types of work important to the national war effort. The first emphasis is given to the preparation of workers for such important war industries as the manufacture of machinery and machine tools, aircraft, and shipbuilding.

Each NYA shop is set up along the lines of an industrial plant. Under skilled supervision the young workers are employed 160 hours each month in actual production work, wherever possible using assembly line and mass

Jack Bell of Houston, operating shaper in South Houston Resident Center shop.



Walter Reese of Washington, Texas operates a milling machine in the N. Y. A. machine shop at Brenham.

production techniques. These young people learn what it means to punch a time clock; they know the importance of observing safety rules and of the proper care of tools. In short, they are learning how to work.

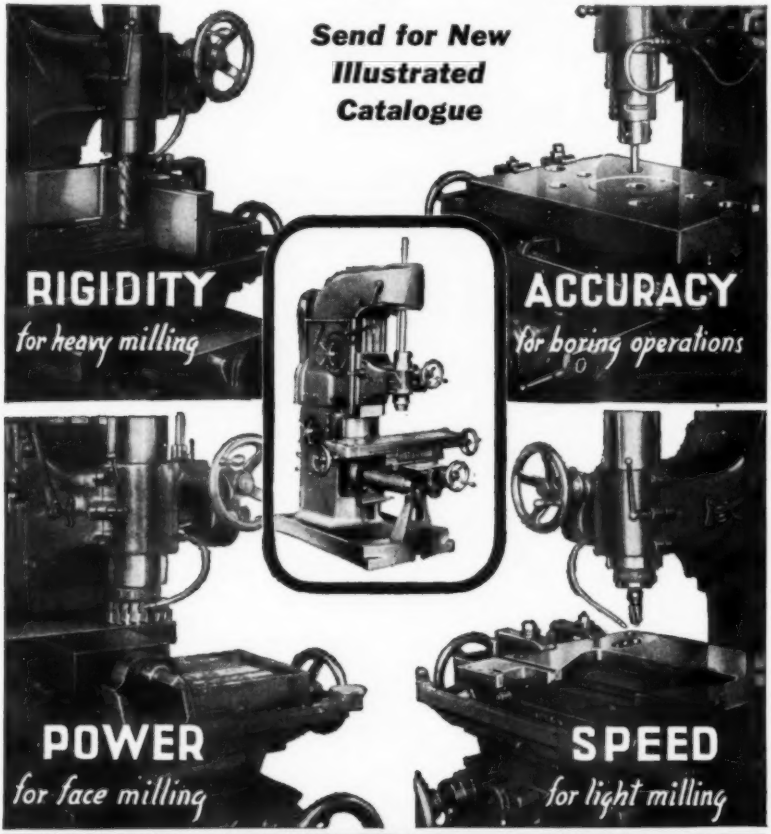
Many employers are now discovering that an NYA youth is the best prospect when they need a new employee who can step into a job with a minimum of time lost breaking in. A manufacturer of machinery in Connecticut writes:—"I would like to take this opportunity to write you as to how the boys, which we have hired from the NYA in Nepaug and Rocky Hill, have turned out. At the present time we have 30 boys in our employ, who are working on machines or machine assembly. According to all reports that I have received from the foremen, these boys are turning out excellent work and are working conscientiously. They are industrious and ambitious without being too aggressive."

The 16,000 young persons who attained jobs in the machine industry after receiving NYA training and experience are but a segment of the 427,000 NYA-trained young men and women who obtained jobs in private industry during 1941. From the shipbuilding plants of New England to the giant aircraft plants of southern California, NYA youth in every part of the nation are at work doing their part helping to produce the weapons of our national defense. Thousands have gone into jobs in aircraft, shipbuilding, ordnance production and other industries directly related to the war effort. Other thousands have gone into the equally important communications and transportation industries.

During the month of December 1941 approximately 230,000 young men and women were employed on NYA projects throughout the nation, including youth in every state, Puerto Rico, Alaska, and Hawaii. Most of these were engaged in actual production

REMEMBER PEARL HARBOR! **BUY DEFENSE SAVINGS BONDS**

4 BIG FEATURES of the Knight Milling Machine



W. B. KNIGHT MACHINERY CO.
3924 W. PINE ST. • ST. LOUIS, MISSOURI

Alvin J. Miller, Brenham, using calipers to measure outside diameter of bushing; Brenham N. Y. A. machine shop.

work, receiving practical on-the-job training. Some 36,000 were employed in NYA resident centers established to tap an otherwise unused labor supply by making it possible for youth to live and work at the job site. Rural youth, and young people from other areas where vocational training or work experience is not available, are thus making their own way while fitting themselves for jobs in industry. All NYA youth are paid small wages, ranging from $22 to $25 per month for those employed on local projects, to $30 for those employed on resident projects with deductions in the case of the latter for subsistence.

Since the demands of all-out war production have produced extreme labor shortages in some areas, the NYA has instituted a plan of controlled migration to bring young workers to the regions where workers are urgently needed. Originally the idea was carried out on an experimental basis. Young workers from states where the labor supply was more than adequate were given basic work experience in their home states on NYA projects and then were sent to an NYA center at Nepaug, Conn., where they were given a few weeks of highly intensified and specialized work experience designed to fit them for particular jobs in industry. After this period, they were placed in jobs in industry through the cooperation of the Connecticut and United States Employment Services. Employers in the Connecticut River valley industrial area have received the plan with enthusiasm and have readily given jobs to the "Nepaug boys." On the basis of this success, the plan is now being extended to other defense areas where similar labor stringencies exist.

Since Selective Service officials have announced that deferments of men for essential jobs are to be only temporary in nature, employers are faced with the necessity of recruiting increased numbers of workers from groups not subject to military serivce. The NYA stands ready to assist industry in meeting this problem. NYA now is giving

"KEEP 'EM FLYING"

BUY DEFENSE SAVINGS BONDS

MATTISON

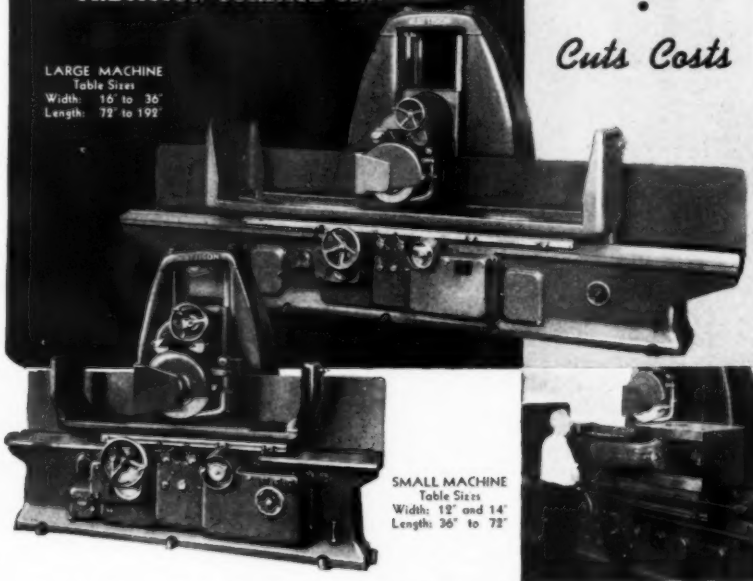
HIGH-POWERED PRECISION SURFACE GRINDER

SPEEDS UP PRODUCTION

•

Cuts Costs

LARGE MACHINE
Table Sizes
Width: 16" to 36"
Length: 72" to 192"



SMALL MACHINE
Table Sizes
Width: 12" and 14"
Length: 36" to 72"

3-ton bonding slide formerly hand scraped in 16 hours, now ground in 6 hours on Mattison Grinder.

Caps previously ground few at a time on small grinder. New Mattison Grinder has reduced time from 7 hours to 30 minutes on quantity shown.

The Mattison High-Powered Precision Surface Grinder has massive double-column support for the wheel head; smooth, rapid, double-cylinder, hydraulic table drive; large capacity; ruggedness of construction and ample power for rapid stock removal.

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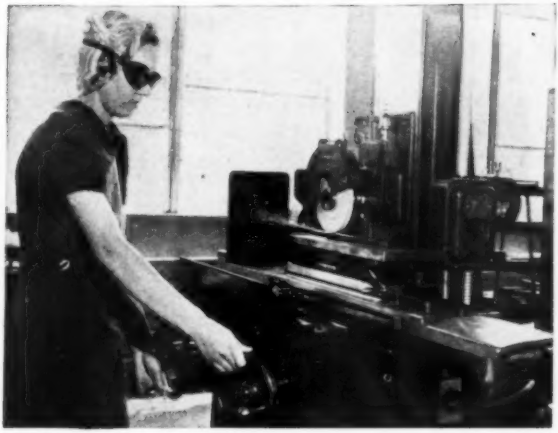

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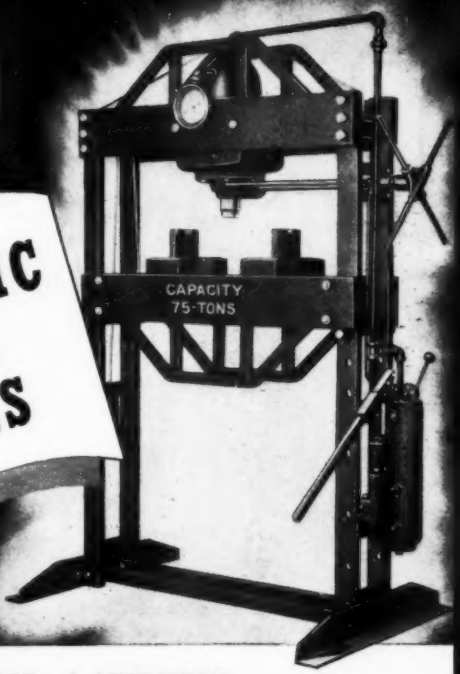

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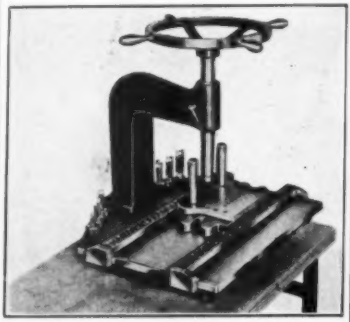

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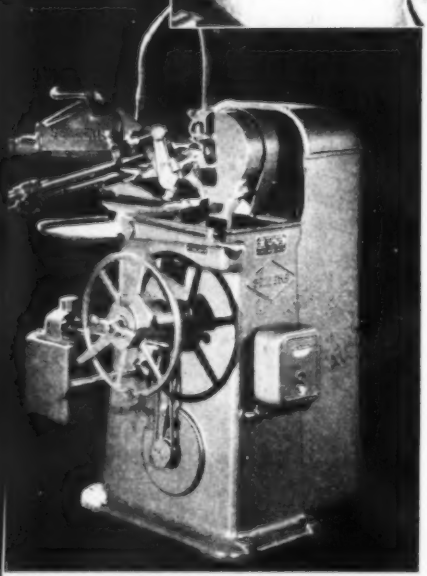

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Shaped Diamond Tools

By PAUL GRODZINSKI, Consulting Engineer

DIAMOND tools for the working of metals by turning and boring became generally known only after the last year, in spite of some applications made public at earlier dates. It can be said safely that the evolution of these tools to real production aids has taken place during the past 20 years. The progress in the production of interchangeable engine parts for use in motor cars and aircraft is more or less due to the superior results from the standpoints of accuracy and surface quality obtained by the proper use of shaped diamond tools. Progress in several directions was necessary to introduce the diamond tool into production.

These were:—

(a) Evolution of suitable cutting edges.

(b) Setting or mounting of the tool edges in holders.

(c) Adjusting the cutting edge towards the workpiece.

(d) Suitable machine tools for high-speed operation, providing small feed and cutting depths.

In all these directions, the diamond tool imposes special demands—in fact one can safely say highest demands; but it was fortunate that simultaneously with the increasing use of diamonds, use of sintered carbide tools and light metals were introduced into the machine shop programs which lead to similar production problems.

It is well known that every tool material including tool steel, high-speed steel, sintered carbide, etc. and every material to be cut, introduces problems of feeds, speeds, chip breakers. Additional considerations are the smoothness of surface required, the durability of the cutting edge and the matter of power consumption. In the case of diamond tools it is frequently said that for many purposes, small splinters, chips or fragments of diamonds are used. This statement is incorrect. Where dependable performance is required, it is necessary that the diamond present a real and substantial cutting edge with definite angles towards the work. As so much depends on the strength of this edge, the tool cannot be just ground out of a diamond splinter (Fig. 1) of nearly the approximate shape. A durable cutting edge will only be obtained if the diamond is cut and polished correctly

Fig. 1. Diamonds shaped according to the form of the rough diamond—an unsatisfactory method.

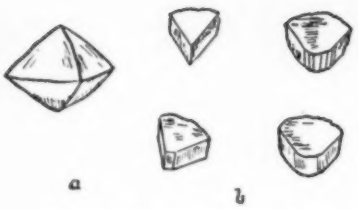

Fig. 2. Diamond tools shaped according to the structure of the diamond crystal. (a) Rough diamond. (b) Shaped tool tips.

according to its crystalline structure. From a finished diamond tool it is not apparent if for this purpose, just a suitable piece has been used, or if the diamond is cut according to its structure (Fig. 2). In the former case, the tool may be offered at a considerably lower price, as a minimum of polishing work is involved, whereas a correctly shaped tool involves a considerable loss in diamond substance (sometimes 40 to 50 or even more per cent) and high cutting costs. As a rough estimate, it can be said that the costs for cutting away a distinct volume of diamond are as high as the loss in raw material. In literature it is mentioned that for the purpose under consideration, black diamonds, i. e., carbons (the cryptocrystalline formation of diamond crystals) are used, but this has never occurred in my experience. Black diamonds are quite useful tools for truing grinding wheels, as well as for rock and stone cutting.

What is the difference between the diamond and other materials for cutting? In the cutting process, a tool edge in the shape of a more or less obtuse wedge breaks out chip elements from the material to be cut. In the case of brittle materials, these have the form of single chips, whereas on tougher materials the generated heat welds the particles together, resulting in a more or less uninterrupted or flowing chip. Recent investigations have shown that the main stress and the main wear of the cutting edge caused by the chip occurs not directly at the point but somewhat distant from it. In such a case, the obtained surface is relatively rough, as the wedging action causes a breaking-up action far ahead of the cutting edge, going deep in the uncut material. However, by increasing the cutting speed, and reducing the cutting depth, the point of chip contact and maximum chip pressure approaches more nearly to the cutting edge, and thereby the formation of the so-called built-up edge (an accumulation of chip debris on the cutting edge) is prevented. In the case of a steel tool stressed directly on the cutting edge, for instance, when taking a very fine chip, it would become blunted very quickly. Consequently, the produced surface becomes inaccurate and rough. From this it follows that a cutting process with high speed and small chip cross-section (small feed by small cutting depth) will prove economical only in case a tool edge

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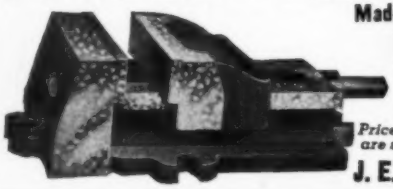

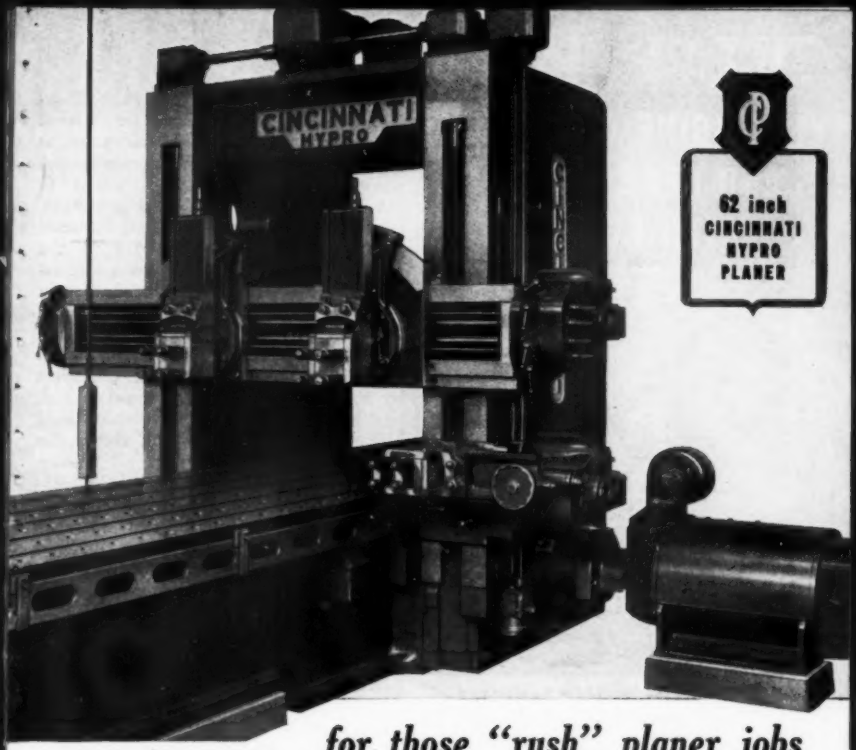

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of great wear resistance is applied. Further, the tool material must be so hard and of such a great compressive strength that its position towards the workpiece is not changed, either in the loaded or the unloaded condition. In this respect, the modern sintered carbides are already superior to the best high speed steel tools, as a softening of the cutting edge occurs at a very much higher temperature and, therefore, speed. However, optimum results have hitherto been achieved only in the case of certain materials by using diamond tips, as the diamond, known as the hardest substance, is of highest wear resistance and shows the smallest compressibility of all known substances. In this respect, the differences between the metallic substances used as workpieces and the non-metallic properties of the diamond may be of special importance, as no momentary welding action between tool tip and removed chips can take place.

As a matter of fact, with a single-pointed diamond tool, very precise surfaces of great smoothness can be generated, and the dimensions of the workpieces can be sustained over a longer time and series of workpieces. Any wear which reduces the useful life of other tools between grindings, requires interruption of operation for regrinding or for readjusting. However, a new tool is necessary in the case of a diamond tool only after very extended use. A point of particular importance is that only one tool edge is in operation, so that the action of the tool is not impeded by that of other tool edges. The single tool point, moving relatively to the workpiece with high speed, cuts a surface which corresponds to the geometrical idea as nearly as possible. To achieve this, rotating workpieces, as in lathes, as well as rotating boring bars, have to be properly balanced.

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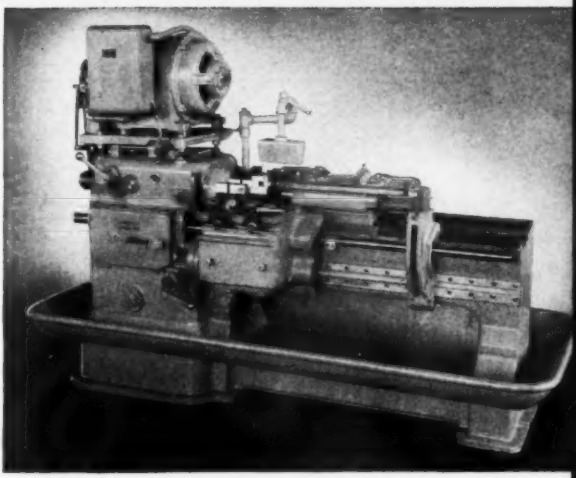

del "LR" is a fully automatic, -operated lathe, incorporat- the time-tested Lo-swing nciple of sufficient mass and id tool support. Its field in- des practically any work hin its capacity — 2" diam. normal stock removal, 4" diam. for light , 5" diam. for flanged work — and up to between centers in the longest bed length. s machine, while offering the utmost in ibility, is 100% mechanical without any tches in the feed train. Not only is the "LR" very simple machine to service, but once it cannot get out of time. All rotating shafts anti-friction bearing equipped. Lubrication adequate and automatic. Carriage ways of hardened steel to provide greater wear isting qualities.

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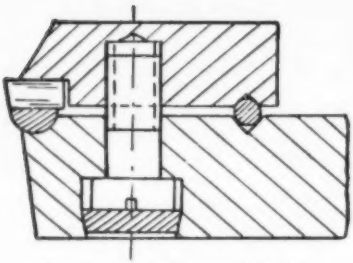


Fig. 3. Diamond connected with a hemisphere of hardened steel or hard metal to relieve any stresses.

One main factor in these fine-boring and fine-turning operations is the cutting speed. Recent investigations have shown clearly that there exists a critical speed above which very smooth surfaces are generated. This speed is for the cutting of steel by carbide tools about 300 feet per minute. This is in conformity with the usual recommendations for diamond tools, viz., that the speed shall not be less than 300 feet per minute; preferably 600 feet, whilst only in emergency cases should speeds as low as 200 feet per minute be used. It may, however, be mentioned that Continental researches with diamond tools have shown that diamonds have produced quite smooth faces below these speeds. This is an interesting fact showing the absence of any affinity of the tool material towards the workpiece, but in such a case the production time is extended, and wear of the tool edge might increase well above usual standards. With high cutting speeds in combination with small feeds, as recommended for these processes, the effective cutting time becomes small with respect to usual boring and turning operations, and it is usual practice to increase the cutting speed up to the limits imposed by the start of vibration in the machine, or the bearings becoming hot.

Owing to the small cutting pressure present at high speeds, no great load acts on the diamond tip. In spite of this, the tool tip must have a rigid mounting and should not be subjected to any bending stresses, which might cause vibration and interfere with the production of a smooth surface. Extreme conditions in this respect are present in the case of profile tools, for instance. Also cutting-off tools and grooving tools of very small width, which further require that the tool holder does not project. Some methods make use of diamonds machined all over, and good results are reported, in spite of the somewhat elaborate method of production. The ideal support for the diamond in a holder is the ball, as thereby stresses imposed on the diamond become relieved. Methods are known whereby a hardened steel ball or hard-metal ball is cemented to the lower side (Fig. 3) of a flat ground diamond, or the diamond is provided with a lower hemisphere (Fig. 4). With these tools, larger chips can be taken than with diamonds fixed according to conventional methods.

The correct adjusting of the cutting edges is a special problem encountered in both cases of turning and boring operations. In the case of lathe tools for external turning it is necessary to distinguish between height and sidewise adjustment. Diamond tools usually have no rake angle. The top sur-

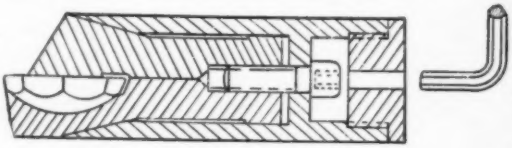
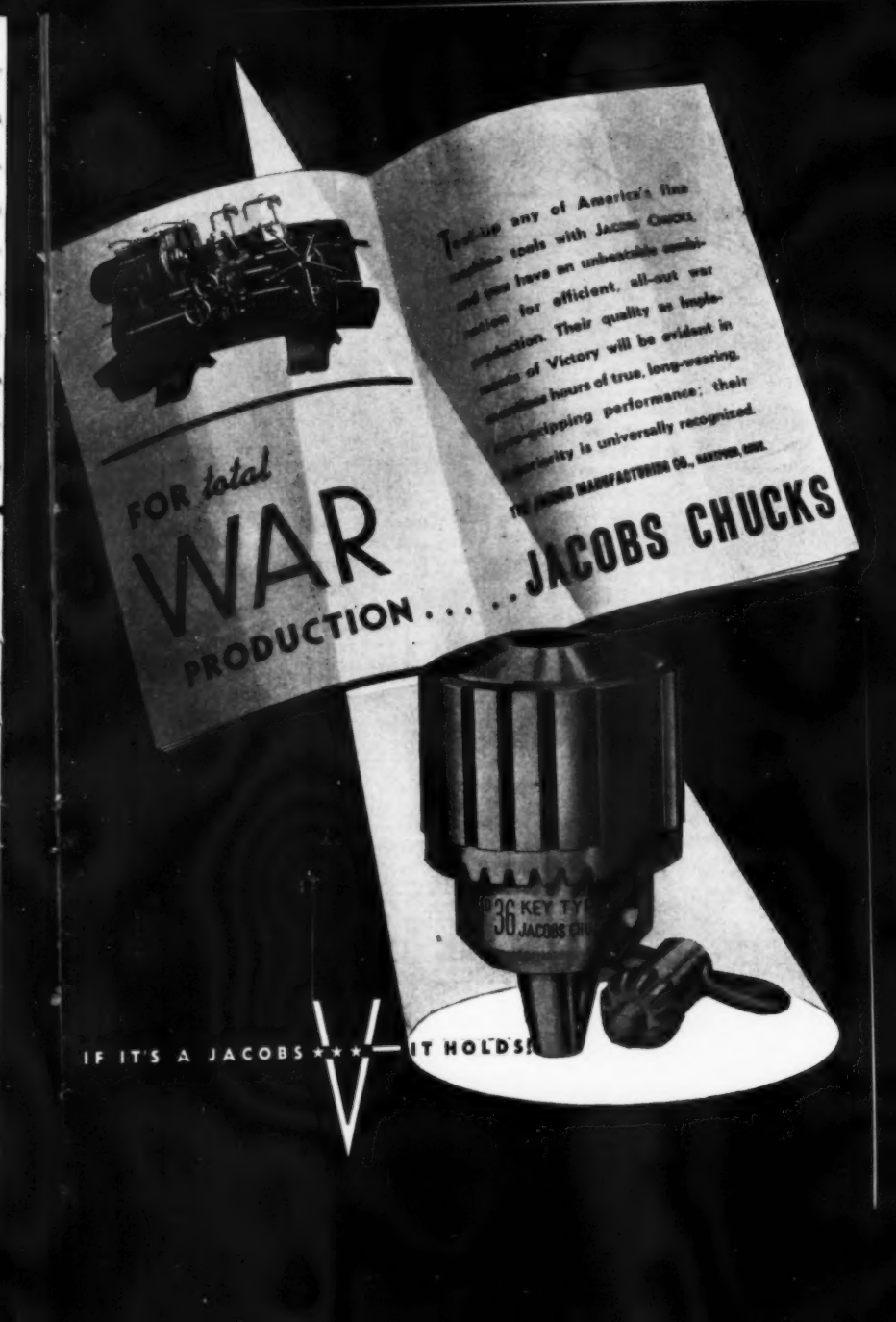


Fig. 4. Special diamond tool according to F. C. Jearum with a hemispherical support integral with the diamond.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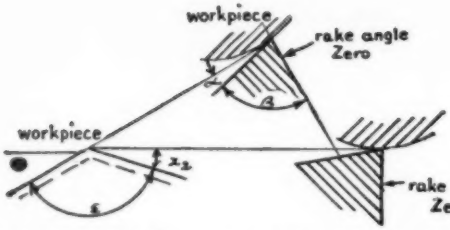

Fig. 5. Tool angles on shaped diamond tools with respect to the workpiece.

face of the tool tip has to be adjusted horizontally, and there is no true rake angle when the tool is on center height (Fig. 5). To obtain small positive rake angles, the tool is usually adjusted slightly over center heights. The extent of this adjustment is, however, limited by the reduction of the clearance angle. This is sometimes considered as an advantage owing to a kind of burnishing action against the finished work face. Some materials such as lead bronze require negative rake angles, and in such cases, correspondingly cut diamonds have to be provided.

On big workpieces, the exact center height is somewhat difficult to find, so the use of special devices is recommended for this purpose. If the tool edge cannot be adjusted on center height, for instance in the case of turning big commutators in their own bearings and in multitool operations (for instance, if several tools have to machine successively the same groove of a piston), a radial adjustment of the tool edges and tool holders in respect to the workpiece has to be used, eliminating dangers from adjustments below and over centers.

The smooth surface is mainly obtained by a kind of burnishing action caused by a small adjusting angle (between 0 to 2 degrees) between tool edge and machined surface of workpiece (Fig. 6). As this angle is difficult to observe and measure when adjusting the cutting edge, optical means such as lenses or tool workers' microscopes are used. Such precautions are

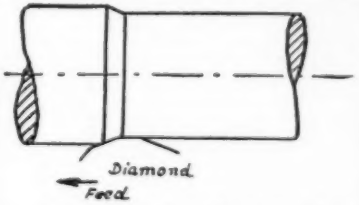

Fig. 6. Smooth surfaces are obtained if the side-adjusting angle (2 in Fig. 5) does not exceed 1 to 2 degrees.

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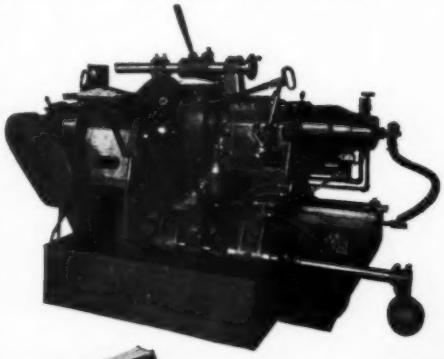

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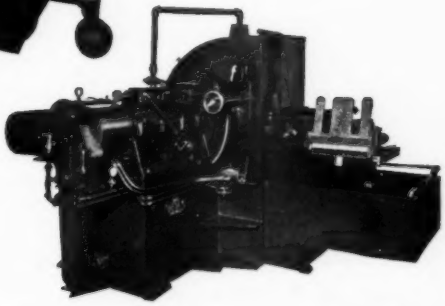

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WRITE FOR BULLETIN 409

T. C. M. MFG. CO.

HARRISON, N. J.

SINCE 1910

necessary to avoid any damage to the sensitive tool edge when brought into contact with the workpiece. A visor containing the 15 to 20 fold magnfication of the cutting edge has proved to be of special advantage for the correct adjustment and protection of diamond cutting edges.

In the case of boring tools, special problems arise, as in such applications the adjustment for the cutting depth and the actual diameter must be contained inside the boring tools, an operation otherwise carried out, for instance, by the upper slide of the lathe. Usually the tool shanks are detachable in the boring bar. These are placed in special lathes, either between centers, or clamped in the tool slides, or fixed in the spindle cones of special fine-boring machines. The tool shanks of preferably cylindrical shape have to be clamped and finely adjusted. Usual clamping screws vertical to the axis of the bar do not represent safe and correct clamping means, in spite of the fact that they are extensively used. At least a soft pad between the end of screw and the tool shank should be provided, eliminating the scoring of the the shank by screw pressure. Better means involve splitting the bar and using binding screws, or using so-called pad-bolts of varying design in solid boring bars. In such cases, good fitting tool shanks are not brought out of center and the clamping pressure is distributed over a wider area.

Of the same importance is the correct design of the means for fine adjustment. Besides head screws and differential screws which engage the free end of the shank, micrometer adjustable tool shanks met with great success when introduced some years ago. In such cases, the tool shank is at first clamped securely in the boring bar, and afterwards the fine adjustment of the tool edge is carried out, for instance, supported by the use of

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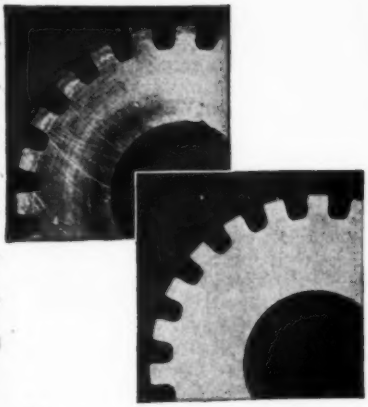

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The Fellows Flame Hardener is a speedy method for heating work for hardening. As an instance, the complete set-up of machine for the 2.3 in. P. D. helical pinion shown at the left took 25 min. It takes just 5 seconds to heat a gear, and 12 minutes for a production run of 50. Distortion is at an absolute minimum . . . For machine and operating routine details write for our 12-page color-illustrated bulletin.

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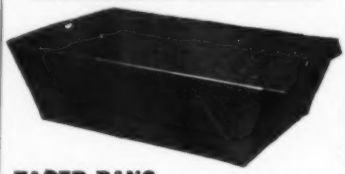

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a setting gauge with dial indicator. Another successful principle is incorporated in the so - called spreading shanks. In this, no other clamping means are necessary, and the boring bar is provided only with the hole for the tool shank. Thus a weakening of the boring bar and eventual throwing out of balance is prevented. After this, the spreading shank is fixed in the approximate position. The fine adjustment of the tool edge is then carried out by means of temporary propelling and withdrawal tools, according to a setting gauge with dial indicator. The main advantage of the two designs last mentioned is that the fine adjustment is carried out after the shanks have been fixed in the bar, thus eliminating possible errors through clamping. Cylindrical holders are nearly always used, as they have the advantage of changing the cutting angles by turning the tool shank on its axis.

As already explained, diamond tools have special requirements with respect to cutting speed, fine feeds and cutting depths, and for this purpose only certain machine tools are suitable, incorporating at least the precision necessary in toolmakers' lathes and grinding machines. High speed machines require special bearings, usually plain bearings with the least possible clearance. Such spindles tend to bind in the bearings when hot. Therefore special devices for conducting the heat away, by means of a continuous flow of lubricating oil or a cooling water jacket, are necessary for bigger machine spindles. The spindles should not be driven by any reduction gears as gears are likely to cause chatter marks and vibration. Therefore a special characteristic of these machines is the absence of any gears in the head stock. Further, the driving spindles should be carefully relieved of any belt stress. There exist two possibilities which are widely used, viz., either

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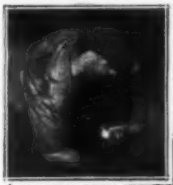
NEW YORK—On production lines, in assembly work and in many types of plant maintenance requiring application or removal of nuts, bolts, studs, lag screws, etc., CP Pneumatic Wrenches (impact type) are saving thousands of man hours. Speedy, powerful, these CP wrenches will run a nut, bolt, stud or lag screw on or off in the wink of an eye. Light, properly balanced, they can be handled for long periods without undue fatigue. Simple in design and ruggedly built, they stand up under hard service with a minimum of maintenance cost.

In addition to the four models shown on this page there are two larger wrenches, CP 365-R for nuts, bolts, screws, etc., up to 1¼" and the CP 375-R handling up to 1¾" bolt size. Complete information on request.

CHICAGO PNEUMATIC TOOL COMPANY

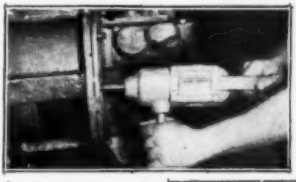
General Offices: 8 E. 44th St., New York, N. Y.

↑ **ASSEMBLY TIME ON THIS PRODUCT** was reduced materially by the use of this CP 349-RP Pneumatic Wrench (impact type). All CP Pneumatic Wrenches are simple in design and sturdily built. Slow speed rotary motors, absence of springs and gears in the driving unit and a minimum number of parts insure low maintenance.



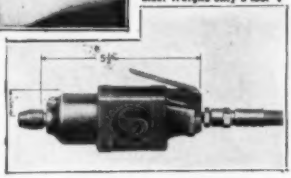
ONLY 5-5/8" LONG and weighing only 4¼ pounds, CP 344-RS is a midget among pneumatic wrenches—but a speedy, powerful tool that handles nuts up to ⅜" bolt size. Can also be used for lag screws, studs. ↓

↑ **FOR NUTS, BOLTS,** etc., up to ¾" bolt size, the CP 360-RS has no superior. In assembly work and in maintenance jobs requiring nut removal or applications, the CP 360-RS wrench quickly pays for itself.



↑ **FOR RUNNING NUTS ON** or backing them off, for the application or removal of bolts, studs, lag screws, etc., there is nothing faster or easier to handle than the CP 349-RP. Has exceptional speed and power for a wrench of its size. Handles nuts, etc. up to ⅝" bolt size.

SMALLEST, LIGHTEST of all impact wrenches. CP 337-RS is brand new. While developed originally for the airplane industry, it has wide adaptability for all types of light nut running, particularly for applications in close quarters. Handles nuts up to ¼" bolt size. Weighs only 2 lbs. ↓



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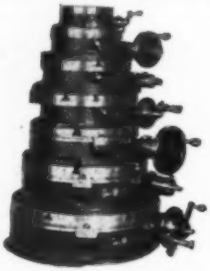

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by arranging the driving pulleys in separate bearings, independent from the spindle bearings, or by driving the main spindle with very accurate bearings from another coaxial spindle by means of a compensating coupling. The second spindle, preferably equipped with ball bearings is, for instance, driven in the usual way by belt, but no thrust whatever, with the exception of the torque, is exerted against the main spindle.

Frequently older machines, lathes or grinding machines, are rebuilt for the purpose of diamond boring and this has proved successful in many instances. It is not necessary to rely on exact slides, if the boring bar in the case of fine boring performs, besides the rotating movement, also the reciprocating feed movement, obtained, for instance, by a screw mechanism and reduction gears, or a differential screw arrangement. A finer feed can be obtained by using usual feed gear boxes and, in addition, a special reduction, and the adjustment of small cutting depths is obtained by special devices incorporated in the tool holder, allowing a fine adjustment and being independent from the condition of the tool spindles.

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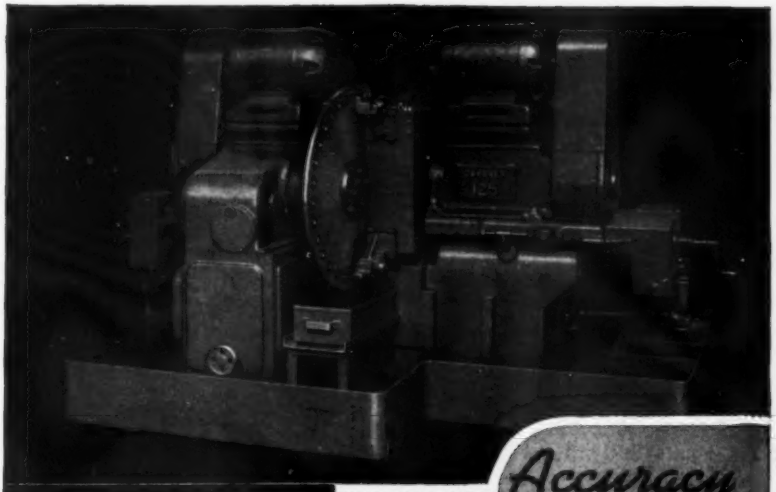

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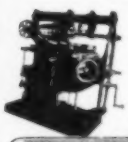

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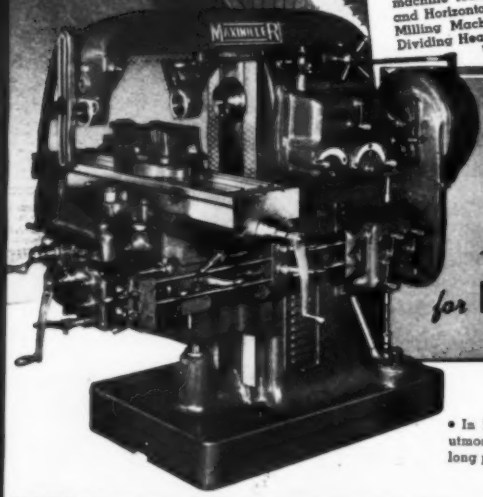
Naturally, in these strenuous war days, KEMPSMITH experience is in demand on a 3-shift production basis. But research and designing for the future are also going forward... and the modern, flexible KEMPSMITH plant will be prepared to aid you in the post-war reconstruction period, with special or "production type" machine tools. Rugged KEMPSMITH MAXIMILLERS, Vertical and Horizontal (Plain or Universal) types: Type G Geared-Head Milling Machines for Tool Room or lighter production work; Dividing Heads; Heavy-Duty Vertical Attachments; High Speed Universal Attachments; Slotting Attachments; Vises; Arbors; Rotary Tables, Etc.



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The Human Factor in Morale Building

By EDMUND MOTTERSHEAD

IT is said that a single modern armored division in the American army carries more machine guns than the entire AEF in France in 1917; that such a division in action will consume about 600 tons of munitions in a single day.

That is simply another way of pointing out that the problem before us today is one of production plus . . . turning out on a scale heretofore unimagined all the mechanical equipment required in modern combat.

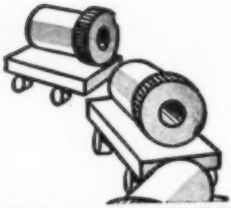
We do not ask why we should do this. In our own fashion as a people we have determined that it must be done. National security for our own way of life demands it. The machine tool industry, normally producing around $200,000,000 worth of machine tools a year turned out over $800,000,000 worth in 1941 . . . not asking why, but finding practical answers to the problem of **how**. This year it is asked that the amount be doubled and that over a billion and a half dollars' worth of machine tools be made available for the productive capacity of the nation.

We demand national security to protect our way of life. We do this because the protection of that way of life means the preservation of individual liberties, the rights of free speech, freedom to worship as we please, freedom to raise our families without fear, the security of our jobs and opportunities to advance.

The American worker must make sacrifices . . . he is making them. Much of the pre - war labor agitation has calmed down for the duration. Public morale is united for a common purpose. The dramatic incidents in the Pacific have awakened most of the country. The worker knows that he must make these sacrifices in time and

This is the first of a series of articles, written especially for The BLUE BOOK by Edmund Mottershead, Dean of the American Institute of Human Relations. In it, the author views the present war effort from a long term view. Thinking that ultimate victory will be a long pull, he makes some practical suggestions towards the solution of a problem that is peculiarly American.

Mr. Mottershead invites reader comment. Send in your own employee morale and human relations stories, problems, etc.



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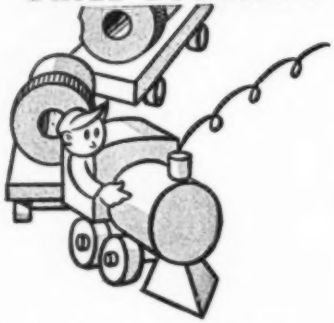

In these days when speed is all important, your production need not be held up for want of drill bushings. For Universal drill bushings in all standard sizes (not special sizes) are now available on a 3-day delivery schedule. With super-finished bores, straight and round within .0001, Universal drill bushings assure accuracy and unexcelled wearing qualities. Write for facts and prices.

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effort, face rising costs of living, higher rents, rationing of luxuries and even some necessities, buy bonds, endure forced saving if necessary so that the purchasing power of national production may be diverted to the uses of war. He is doing all these things because they are necessary for the safeguarding of the country which makes his life possible . . . necessary for the continuance of the American Way.

However, we have a two-fold problem:—mechanistic, involving the production of physical things and the organization of systems; and the human problem of morale.

We must have organization to provide the most efficient channels through which can be guided our enormous effort of production. The production effort itself must be carried to whatever physical limits are eventually discovered necessary, with limitations only of time and strength and material. And that production effort depends directly upon the earnest, loyal and determined effort of the workers.

The other problem . . . morale . . . will presently require greater attention than it has so far received. Webster defines morale as a mental state, relative in nature, being either good or bad depending upon our standards of judgment, involving zeal, hope, determination and devotion resulting in perseverance in the face of danger, fatigue, discouragement and the like.

Morale is essentially two-fold, compounded of mental conviction and emotional enthusiasm. Conviction is necessary, but by itself lacks motive power. On the other hand, an enthusiastic faith is often sufficient by itself. Workers today are bending every effort towards the success of the victory program. Why? Because they have the conviction of the necessity of it. Because for the time being, wages are up and incomes are greater

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than they have been in the past few years, and because at this early stage of the war, there is still the initial enthusiasm resulting from the tragedy of Pearl Harbor.

But our cities have not been bombed. Except in a few instances, we have not had many practice blackouts. There has been little interference with our daily lives. General MacArthur's heroic efforts are thousands of miles away from us. We have not had food shortages. Tire rationing will not be felt much until the ones we have begin to wear out. Food rationing is a long way off in our way of thinking. A comparatively small section of manpower has been called to the colors. We can easily fall back into the indifference which brought about our general state of unpreparedness.

We are noted as a nation of extremists . . . either supremely confident or supremely discouraged, and in our thinking, overconfidence means lack of preparedness and discouragement means "Why fight? It isn't our war anyhow." Either attitude will be fatal to our general defense effort. Either attitude, even both **can happen** . . . but can and must be prevented. We compare our productive capacity with that of the enemy and recall that the engine requirements of a single American armored division are reported to be almost equal to Japan's entire monthly production. Our oil and gas and steel resources are the greatest in the world. The Russian Bear and the Russian Winter are making things tough for Hitler. "Why worry? We can lick them with one hand and go on eating with the other." Or . . . we look at events in the Pacific and become discouraged, thinking that this war will drag on for years and years, . . . see the inconvenience and nuisance of it all and let down. We note the slowness with which aid has been organized for MacArthur, for Singapore,

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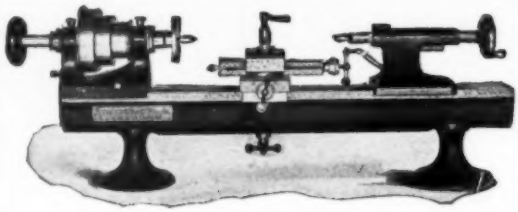

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for the gallant Dutch and wonder if with all our halting efforts we will ever get any place.

These are the real dangers . . . overconfidence, complacency and despondency. The strategics of the present situation make these threats to morale inevitable, because it is going to be, not only a long and difficult war, but also it will be a long time before we see some real decisive action on the part of our forces.

The British face the same problem. Several million trained and equipped soldiers are sitting around the British Isles inactive. Hence the raids of the Commandos. Hence the continual bombings of the continent. Hence the dramatic publicizing of whatever success is achieved. But they have had several advantages to morale. They have had Dunkirk. They have been bombed. They live under the threat of additional bombing. Not that anyone in his right mind would wish for such disaster here . . . but the simple fact is that nothing has contributed to the high pitch of morale among the Chinese, the Russians and the British more than bombing incidents. We do not face immediate danger here . . . only some inconvenience and annoyance. We have the hard work, the sacrifices, the boredom, the privation, without the satisfaction of facing dramatic dangers.

And so because our morale faces the problem of the undramatic long pull, it will be more difficult to build up and sustain. We must strive to maintain a rational balance between discouragement and overconfidence, together with sustained determination to do everything that the job demands.

The health of the workers, working conditions, the security of their jobs, labor relations . . all are factors in the situation . . . and to a great extent, factors which are sufficiently obvious that we give them attention, and keep

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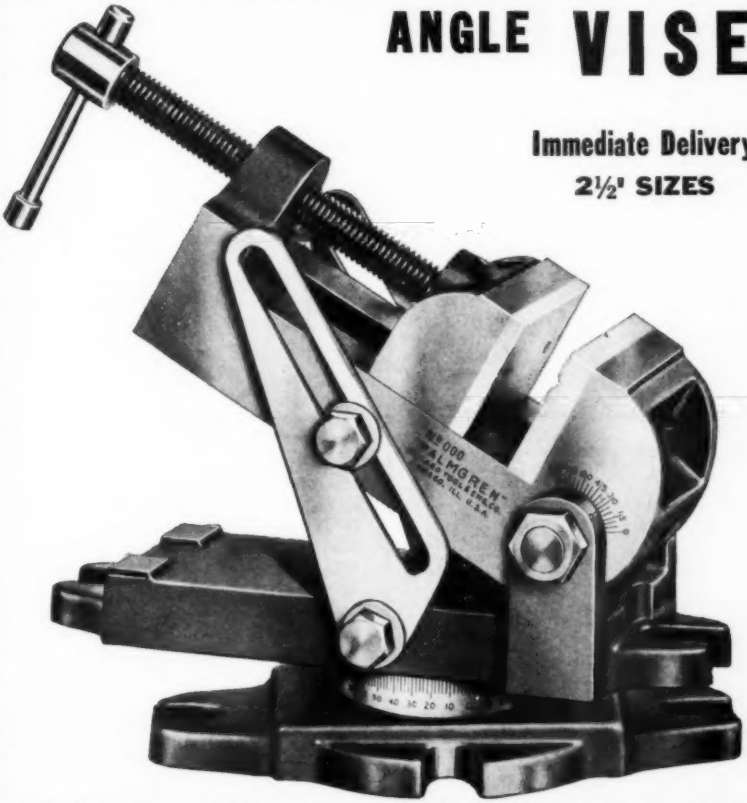

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NEU - T - ROL releases the work promptly from the magnetic chuck and demagnetizes it as it releases it. There's no need for tugging, hammering or prying. NEU-T-ROL saves time, saves chuck faces, saves chance of operator injuries and saves warped, bent or broken work pieces.

NEU-T-ROL is easily installed on surface grinders now in service—or manufacturers will build them into your new surface grinders if you just specify "NEU - T - ROL". Bulletin No. 21 gives full information.

Two Types: Motor Controlled for Remote Control—and Manual Controlled for small units. "There's a Neu-T-Rol for every size of chuck."

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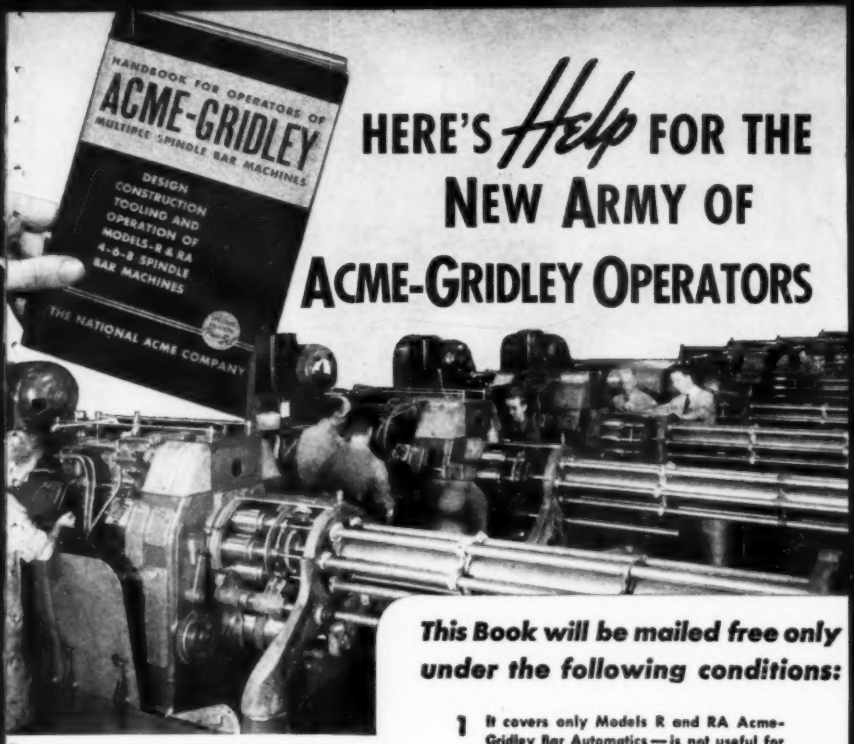
them under control. However there is another factor, which in the pressure of circumstance and events is too often overlooked . . . the human element.

I do not mean that the solution to the human problem in industry lies in the paternalism which is disliked by labor and management alike; nor do I mean a propaganda barrage of posters, headlines and the like. What I have in mind is the same handling of the human problem which is inherent in any successful relationship between labor and management.

In the pace of modern business, we try so far as possible to mechanize each process for efficiency, reducing it to the simplest repetitive operation through time study or cost accounting analyses, and in so doing we forget that in each and every instance we are still dealing with **live** people.

Under the enormous pressure of the required production for defense, that drive for efficiency, for mechanical precision, for greater and ever greater results to be obtained faster and faster all the time . . . we tend more than ever to overlook the human element. If we think of it at all, we think of it in terms of mass psychology . . . of public opinion. Not in terms of separate individuals working with us and around us. Hence we incline towards leaving it to the newspapers to mould public opinion and think of our fellow workers as man-hours, units of production, and labor costs . . . forgetting that these are but the symbols of a system, and that behind the symbols are real, live people with sensibilities and aspirations not unlike our own.

Andrew Carnegie paid Charles Schwab a million dollars a year, not because of his genius or because his knowledge of steel was so greatly superior to that of a dozen other men . . . but because of his exceptional ability to handle men. Schwab himself once said, "I consider my ability



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3. If our records show that you have already received a copy, another will not be sent.
4. If you are not a foreman, operator or assistant, but merely interested in this book, send 50c (a fraction of its cost) with your letter. Such orders are not encouraged.
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to arouse enthusiasm among the men the greatest asset I possess, and the way to develop that in a man is by appreciation and encouragement . . . I never criticize anyone . . . If I like anything I am hearty in my praise."

If the people around you and working under you, like you and feel at ease with you, they not only work better for you and for the common goal, but are happier themselves.

Not long ago I was talking with the manager of a firm employing some 1500 persons, now engaged in the manufacture of gun mounts. I asked my friend how things were going and what the sentiment among the workers was. He told me that morale was high, and things were going along very well. So I asked him what he thought was the reason for the loyalty and enthusiasm of the men. He thought a minute and then said:—**"I think it is because the half a dozen top executives in the firm actually know a great number of the workers by name, and from day to day see them and speak to them personally."**

Personal acquaintanceship is important . . . recognition by the executive of the worker as an individual, not as a mere lowly cog in the machine, but as a person whose contribution is to the success of the whole is vital.

A man's name: A small thing; yet what magic lies in the sound of it . . . to the man who owns it! Learn it; use it often, and he feels unconsciously that he is an individual, that you recognize him as such, that he at least stands out from the shadows of the crowd. His work may be humble, possibly the mere adding of the same finely-drilled hole to the same part day after day . . . and yet it is important . . . to him and to society. The Hawthorne plant experiment proved that if the worker can be given some opportunity to use his initiative and can be shown the vital importance of

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A complete line of full sized, full weight 10", 11" and 12" Precision Lathes . . . bench, floor and pedestal types built to industrial machine tool standards and specifications. Rigid heavily braced, semi-steel beds with hand scraped ways —2 "V"—ways and 2 Flat Ways. Large hardened steel spindles, ground all over and individually fitted into hand scraped bearings. Each lathe has a full complement of attachments and accessories. Each model gives more lathe per dollar.

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The machine is shown milling slots 1 1/16" wide x 7 15/16" long, in one of 12 steel guard frames for grinding machines at Barber-Colman Co., Rockford, Illinois. A 1/4" diameter End Mill is hand fed using a spindle speed of 2200 RPM. Frames are milled complete in 2 operations—2 1/4 hours Floor to Floor.

This is a typical Super-Speed Vertical Spindle milling job similar to a great many jobs found in any tool room. The Gorton Miller is exceptionally well adapted to work like this because of its many exclusive features, such as super-spindle speeds to 6000 RPM on standard machines and 17,500 RPM on special machines, permitting efficient use of small cutters. An adjustable Ram Type Head doubles table cross feeds, saves extra setups on large work, greatly increasing capacity of the machine. Moreover, this head can be raised by inserting raising blocks for increasing distance between spindle nose and table.

Possibly there are many small lot jobs in your tool room where this machine can be used to excellent advantage. Upon checking you may find, as others have, that this machine will do the work formerly required of two machines.

Gorton engineers specialize on Vertical High Speed Milling. Consult them without obligation.

SUPER-SPEED MILLING DATA

Machine—Gorton 9-J Super-Speed Vertical Milling Machine.
Part—Guard Frame.
Material—S.A.E. 1020.
Quantity—12 pieces.
Cutter—1/4" dia. End Mill.
Operation—Milling Slots 1 1/16" wide x 7 15/16" long, leaving 3/32" stop around inside of frame.
Holding—Simple clamping to table using "T" Slot bolts and clamps.
Feed—Hand.
Speed—2200 RPM.
Time—2 Hrs., 15 Min., (2 operations) Floor to Floor.
Finish and Accuracy—Good Finish —.005" Commercial Tolerances.

How to handle High-Speed Vertical Milling jobs is explained in Catalog 1105-A covering Gorton Super-Speed Vertical Milling Machines. **WRITE FOR YOUR COPY TODAY**

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his contribution to the whole, he will work better, faster, more efficiently, and take a joy in doing it. He must be made to know that you realize the importance of his individual efforts.

I am always reminded of the comment of an old New England farmer speaking of Americans in general:—"You can lead 'em by the nose through the smallest dang knothole, but you can't push 'em around." That is the sentiment that is inherent in our dislike of dictatorship. That is the sentiment that makes us sure we shall not have dictatorship here. As a people we can't be pushed around. And the people working under you are the same kind of people. They can be led, but not driven. Today the order comes from Washington:—"Produce!" It is passed down the line: "Produce! Fast!" But from the executive to the worker it must be: "Let's do it. Let's do it bigger and better than ever. WE'RE doing it!" not:—"**YOU** do it!"

So when faced with the necessity of getting somebody to do something well and in a hurry, don't just order them about. Ask a question; make a suggestion; or state the problem in such a way that the required action is apparent. You'll get far better response.

Show hearty appreciation of sincere effort. Schwab was not too big to give it to the lowest paid worker in the plant. Certainly you can do it too. And by doing it you do more than give the other fellow recognition and a feeling of importance; you also give him a good reputation to live up to . . . help him to sustain good effort and try for even better results.

And above all, be sincere. A great deal of thought and study has been given to the problem of how to get the other fellow to do what you want. Remembering names and faces, "you-consciousness," so - called techniques of human relations . . . have been very much the vogue. But artificial tech-

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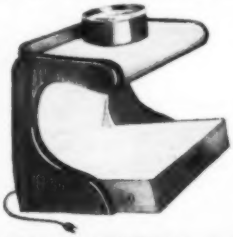

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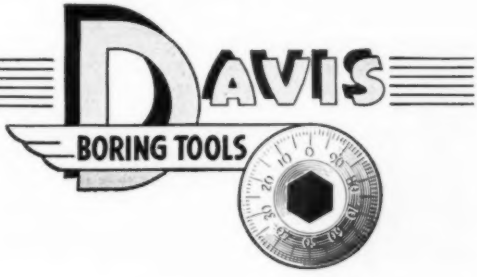

niques even skilfully applied are not enough. They break down under the stress and strain of the times just as so much else that is false and artificial has broken down. Show appreciation; recognize the worker as an individual human being; remember his name and use it; lead instead of trying to drive; . . . but do it sincerely because you must actually see the human being behind the symbols of the system.

Some years ago, $25,000 was spent on the Meriden Survey to determine the interests of adults. Personal health ranked first, and how to get along with people second. And that ability to get along with people is not something inherited by some people and left out of the make-up of others. It is simply something that can be acquired through conscientious training or through experience and self-discipline . . . by making habits of thought and action in terms of the other fellow, instead of concentrating on your own selfish interest first.

Today we have an emergency, a real crisis in our national destiny; a situation which will have its effect upon our lives and the lives of our children for generations. We can pass through it and come out with starved bodies and warped minds, emotional unbalance, the loss of spiritual, moral and social values; or we can pass through it and shake off the flub-dub of our present misunderstandings and limited vision and find for ourselves a finer way of life than before. We would have that same problem without a war . . . probably taking a longer time to accomplish the same end result.

It is the problem of living with the people around you, finding some happiness and helping them achieve the same goal. It is the problem of getting people to do what you want them to, making them and keeping them happy about it. It is much the same problem as that confronting the young man who goes "a'courtin'." He has a certain young lady in mind, fat, thin, short, tall, beautiful . . . the female of his dreams. First he must get her to **like him,** then to **understand him,** then to **believe him** and have faith in him, and finally to **follow him.** "Courtin'", and "courtesy" are closely related. If you deal sincerely with people on this basis, whether from behind your desk or among your fellow-workers in the shop, you will find many otherwise rough roads made smooth.

Emerson said:—"Every man I meet is my superior in some way. In that, I learn from him."

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Fluorescent Lighting Maintenance

By E. W. BEGGS

ALTHOUGH fluorescent lamps have an extremely long average life, they nevertheless wear out and eventually burn out or fail in service. When this time comes, the old lamp must be replaced by a new one. The fixtures should be so designed and made that lamps can be replaced easily and the location of the fixtures should be chosen to provide for ready access to them for maintenance.

It is impossible to predict when each individual lamp will burn out, but it is quite possible to predict the number of lamps that will fail in any given group of lamps used over a definite period of time, if the conditions are known and particularly if the group is quite large. Lamp life expectancy curves, which are similar to actuarial data for humans, are used, and with them a maintenance program can be developed that will provide maximum satisfaction at minimum cost.

In developing such a program the lamp life expectancy should be divided into two parts. The first part is an analysis of the group of lamps installed when the fixtures were first put into operation, and the second part is an analysis of subsequent lampings.

Fig. 1 — **TELESCOPING PLATFORM BRINGS MAINTENANCE MAN TO THE FIXTURE**—This simple type of lift, ranging up to 15 feet to the platform level can be used for mounting heights up to 20 feet, but, in general it is well to have a platform device with a little excess working height in case it is necessary to go above the fixture for electrical or mechanical operations.

Since the initial lamps are all new, few, if any, fail during the first few hundred hours of service. As the group of lamps ages however, an increasing number will burn out with the rate of mortality greatest at or near the average life point. A few will remain in service for a considerable period of time. With the average run of fluorescent lamps, however, there is a fairly wide spread in life, and about half of the first lamping will fail in a period equal to about one-third the average life of the lamps.

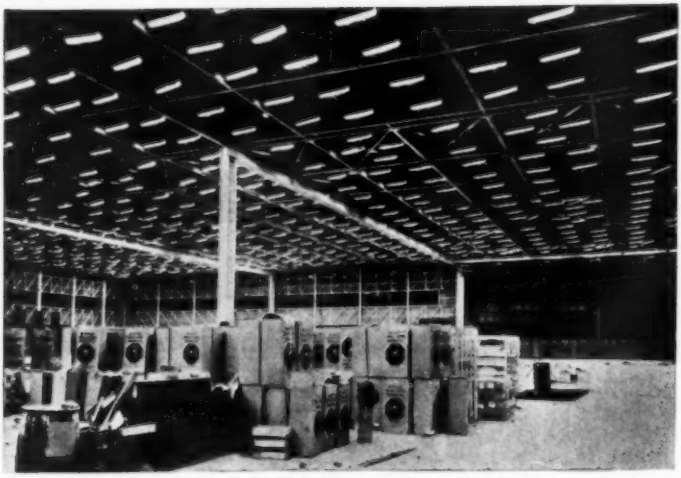

Fig. 2—**INDIVIDUAL LOWERING HANGERS** provide ready access to these fixtures in a new, large airplane factory. Each fixture may be lowered to the floor for servicing.

The mortality curve follows the life cycle of the first or initial lamping only. From it these conclusions may be drawn:

1. About half of the lamps will have burned out when the average life point is reached.
2. A few lamps will burn out quite early.
3. A few lamps will live far beyond the normal life expectancy of the group. (Note:—The average of the group cannot be determined until these lamps have burned out.)
4. Most of the lamps will burn out near the average life point.
5 The rate of failure varies widely, rising gradually to a peak at the average life point and then diminishing as new lamps are installed.

The approximate number of lamps per month or per year that will need to be replaced after the replacement curve levels out can be estimated from this formula:

$$\text{No. of Failures} = \frac{\text{Hours Burned X No. of Outlets}}{\text{Rated Lamp Life}}$$

This is the formula that should be used ordinarily, although deviation from this average replacement rate must be taken into account during the first few lampings.

The principal maintenance requirements for economical and dependable lighting are:

1. Provide means for access to the fixtures for cleaning and relamping.
2. Use fixtures designed to provide for ready cleaning and relamping.
3. Provide in advance for the replacement of lamps that are to burn out. In this, it is generally best to consider first replacement of the initial group of lamps and then to plan for the

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Leading defense manufacturers the country over are using this inexpensive machine to accurately finish internal cylindrical surfaces from .185" to 2.400" Accuracy within .0001" is guaranteed and has often been held to .000025" in production work.

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ultimate, less erratic, replacement rate of related group of lamps.

4. Consider the relamping and maintenance requirements of the installation when choosing the size and type of lamps.
5. Where a fixture or group of fixtures is extremely difficult to service, use the group replacement plan.

Means of Access

The more common devices now in use to reach a lighting fixture include: —ladder, movable platform, and lowering hanger. The choice is not always easy. Conditions will largely determine the best solution, but in theory a decision can be reached on the basis of cost computations. This is done by first establishing the labor cost of a single relamping with each device and then, based on the number of lamp renewals needed per year, determining the overhead cost of the equipment per renewal. The most economical method, of course, is the one which shows the lowest combined cost of renewal labor plus overhead.

In general, it will be found that each device has an important place in the picture. Ordinarily, where very large numbers of units are to be serviced, the movable platform is the cheapest. Where there are a medium number of units, a ladder is least expensive. Where there are only a few, the lowering hanger is the most economical.

However, where a movable platform cannot be moved about conveniently on the floor to bring the maintenance man to the fixture, or where the design of the building renders the use of a ladder impracticable, the lowering hanger is not only the best but is often the only solution.

Fluorescent lighting equipment can be serviced occasionally from a catwalk designed especially for the purpose or, if the layout is carefully planned beforehand, it may be serviced from a truss or modified truss paralleling the fixture. Such a system would be unusual but, where possible, should be provided. Servicing of fluorescent lighting fixtures from a traveling crane requires a suitable safe operating platform which should be provided when the crane is installed.

A Typical Large Installation

Consider a defense plant with 10,000, 40-watt lamps burning 20 hours a day and 25 days a month throughout the year. The relamping problems here are startling.

Fig. 3—**AUTOMATIC TELESCOPING TOWER** speeds lighting adjustments and maintenance in this large auditorium. Telescoping platform for extremely high mounting is used to service a lighting system. Where maintenance work of a high order must be carried out and where there are many fixtures to be serviced, a convenient platform such as this is almost a necessity.

Substituting in the formula and computing the average number of replacements ultimately to be required, that

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is, 10,000 times 500 times 12 divided by 2500 equals 24,000 lamps to be replaced per year, or 2000 lamps per month after the first few relampings. That would be a sizable maintenance job, but the ultimate average replacement rate of 2000 per month is only about half of the peak replacement rate that occurs at approximately 2500 hours and again at approximately 5000 hours.

The replacement curve reaches a peak of almost twice the average replacement rate after the lamps have burned about 2500 hours. This means that whereas 2000 per month or about 80 lamps per day would be relamped after the replacement curve levels out, over 130 lamps per day would need to be replaced during the first peak period which, in this instance, would occur at about the fifth month.

It is obvious that in installations involving large numbers of lamps such as are now being installed, particularly in some of our new defense plants, the maintenance engineer must anticipate not only the average renewal rate but must lay his plans to handle the peak load when it comes.

When to Remove A Lamp

It should be noted that the fluorescent lamp blinks on and off when it reaches the normal end of life. This blinking is caused by the high voltage that develops in the lamp when the emission material is worn away from both of its electrodes. This high voltage actuates the glow switch, normally used, to switch the lamp alternately on and off. Blinking should not be permitted to continue for more than an hour or so or the starters will be destroyed and perhaps the ballast will be overheated and damaged. This means that all of the previously mentioned requirements, viz., ready access to the fixture, proper fixture design for quick relamping and maintenance planning are especially important; otherwise, the switch damage and possible ballast damage will represent extra operating cost of the lighting system.

Special cutout devices are now available to prevent the blinking from con-

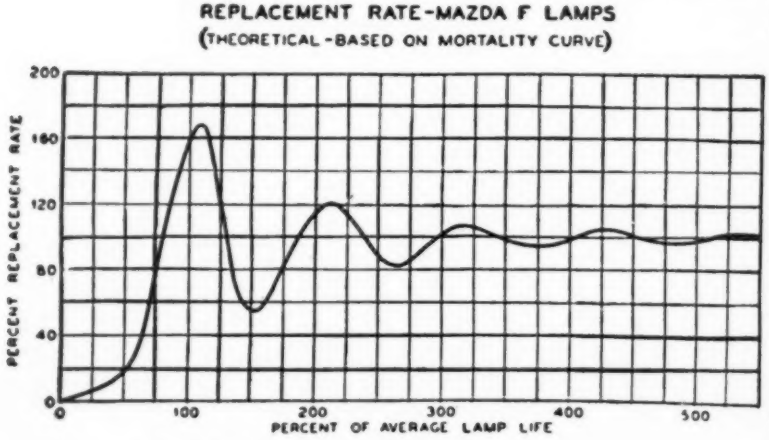
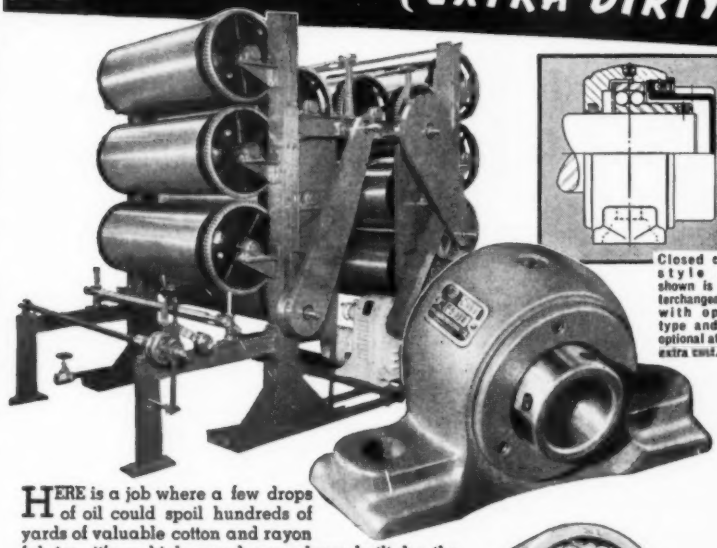
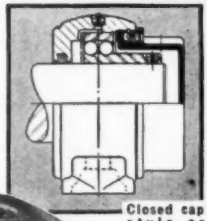


Fig. 4—**REPLACEMENT RATE CURVE** for Mazda F lamps.

When the job is { EXTRA CLEAN or EXTRA DIRTY





Closed cap style as shown is interchangeable with open type and is optional at no extra cost.

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Where conditions must be spotless this bearing is ideal since it gives positive protection against oil leakage. It also offers complete protection on other types of equipment where operating conditions are excessively dirty. The same combination of seals makes certain that dust and grit can not enter and cause wear.

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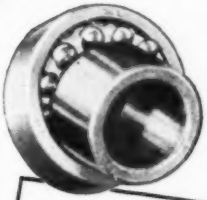

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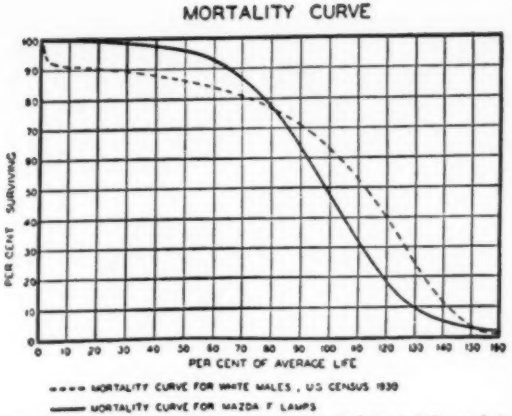

Fig. 5 — MORTALITY CURVE for initial lampings.

tinuing beyond the danger point. The 85-watt, type RF, lamp now requires no starter. Therefore, in certain instances this becomes an advantage from the maintenance standpoint, of sufficient importance to be considered in planning the lighting installation.

Choice of Size and Type of Lamp

Naturally, the fewer the lamps used and the longer the lamp life, the less will be the lamp replacement problem. This would lead to the use of larger sizes of fluorescent lamps to reduce relamping cost. The 85-watt lamp has a 3000-hour life and requires no starter so it is especially well suited for installations where relamping is difficult. The 100-watt lamp with its high output reduces the total number of units required for a given lighting job and is also well suited to large installations where lamp maintenance will represent a serious problem.

Group Replacement

Fluorescent lamps have, on occasion, been installed in fixtures with which relamping is extremely difficult and expensive. Some of the early fixtures, for example, required special tools and had to be partially dismantled in order to remove burned-out lamps and install the new ones. Also, some fixtures are located where access is difficult and where it is extremely costly to relamp and maintain the fixtures. In such cases, group replacement, familiar to most lighting engineers in connec-

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tion with incandescent lamps, should be used.

In practice, the simplest method is to replace all the lamps in the fixture or group of fixtures each time access is obtained. Those lamps which are not burned out may be used, if necessary, in other more accessible fixtures.

Group replacement may also be found to reduce the overall lighting cost if applied to an entire lighting system where access to the fixture is an appreciable cost item, or where it is vital that a minimum number of lamps be inoperative at any one time. Operating under such a plan, a maintenance engineer would anticipate the approximate time of maximum replacement. Such a time could be estimated from the previous discussion, particularly with the replacement rate curve shown in Fig. 4. For good results, the lamps should be replaced shortly before the period of peak mortality or peak replacement. In this case, the lamps that are removed before failure, can be used elsewhere or destroyed, depending upon conditions.

Conclusion

If good lighting at minimum cost requires easy and regular maintenance, and preparations are made ahead of time for relamping, considering the peak as well as the average replacement rates, then long range lighting satisfaction will be assured.

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Carbide Drawing Dies

By JAMES R. LONGWELL*

INTRODUCED more than a decade ago, cemented carbide wire drawing dies are today regarded as standard tools of the wire industry. Wherever any appreciable wire drawing is performed, there carbide dies will be found.

However, in the past few years a widening scope of uses for carbide dies has developed in steel mills as well as in companies working with brass and aluminum.

Rapidly increasing in number are the applications of special carbide dies to the production of special shaped parts of uniform section, required in relatively large quantities. This is particularly true since the inception of the War Program and in connection with the production of parts on which close tolerances must be held in large scale production, which makes the use of steel dies for this type of drawing work prohibitive from the standpoint of number of dies required over a given productive run.

Thus, today, carbide drawing dies fall, generally speaking, into one of the the following classifications:—

1. Conventional round wire drawing.
2. Drawing of standard shapes (hex, square, etc.)
3. Drawing of special shapes of wire and of special shape parts as an alternative to machining from bar stock.

While steel dies are still being used extensively for the third mentioned class of work, carbide dies are being applied where close tolerances must be maintained over long runs. Today, carbide dies are consistently producing parts — by drawing — to "machined" tolerances.

Cemented carbide nibs for dies do not, of course, eliminate the necessity of scrapping dies when they have worn oversize. However, the extremely long life and high wear resistance of carbide dies changes the cost picture materially. Though such dies are more costly from the standpoint of basic material, the expense and time of finishing the dies—whether of carbide or steel—usually far outweighs the material cost.

Wire Drawing

As far as drawing round wire with carbide dies is concerned, practices are now pretty well established. In recent years there have been a number of improvements in die finishing equipment, but such improvements have been detailed rather than fundamental.

One point perhaps might be well to keep in mind under today's conditions. With demand for wire at a peak and mills straining every effort to maintain production at high level, proper die maintenance procedure has become more important than ever before. Dies

*Chief Engineer, Carboloy Co., Inc.

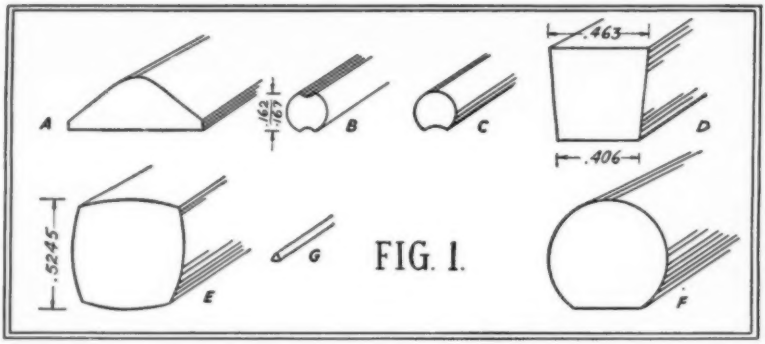

FIG. 1.

should never be allowed to wear until a deep ring has been formed. They should be touched up, if necessary, every time they are returned to the die room—and as soon as they do, so that they will be ready when needed. Regular touching up of dies eliminates, to a large extent, the necessity of recutting dies, eliminates tie-ups, reduces down-time of mill equipment, reduces spoilage, increases mill tonnage—and, peculiarly enough, actually results, 9 cases out of 10, in cutting down on the number of man-hours required to finish and refinish dies.

Standard Shapes

Drawing of special shapes with carbide dies is a more recent development and has been materially stimulated by the introduction of shape-die finishing equipment. With this equipment, mills are now able to purchase rough-cored dies and finish such dies themselves. The finishing equipment is also used to keep the die in condition. In addition to die finishing equipment, the shape-die equipment available includes machines for producing the special laps needed for shape dies. One practice fairly widely followed is to save the first length drawn through the shape die to cut up for "laps" for use when reconditioning the die. Laps produced in this manner may be used even if slightly undersize with respect to the desired hole dimensions, by applying side pressure to the lamps when lapping.

It should be noted, however, that many special shape dies are still being produced from round hole dies. Mills faced with the requirement of

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relatively short runs on special shapes find it quicker and more economical to produce the necessary special die by shaping a round hole die available on the mill's shelves. Where a single die or set of dies suffices for the run, this procedures is still less costly than ordering a single special shape cored die, in addition to the time saving involved. However, it should be noted that this method is satisfactory, mainly when the shapes to be produced are relatively simple in character.

However, in most cases, special-shape dies rarely require much resizing. Most special shapes are produced to a single size. When the die has worn oversize, there is little that can be done except scrap the die for that particular type of work. Sometimes such dies can be re-bored and converted to other types of work, however, at the mill or by the die producer.

In spite of these seeming handicaps, more and more highly specialized shapes are being drawn with carbide dies which is probably evidence enough of the economy of their use.

Machining by Drawing

Dies for this type of work do not differ radically in general appearance from conventional drawing dies. As in the case of wire drawing, breakdown dies are sometimes used at times ahead of finishing dies.

Fig. 1 shows a number of special shapes of steel parts now being produced with carbide dies. The section shown at A is produced in one draw with a carbide die finished to the special shape required.

At B is shown another specially shaped part, consisting of a round section with two accurate longitudinal grooves, toward the bearing of the die. It is to be noted that the diameter of the finished part is only a

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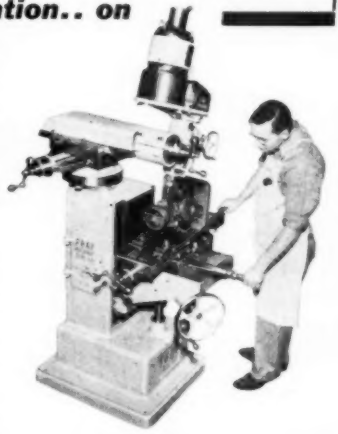

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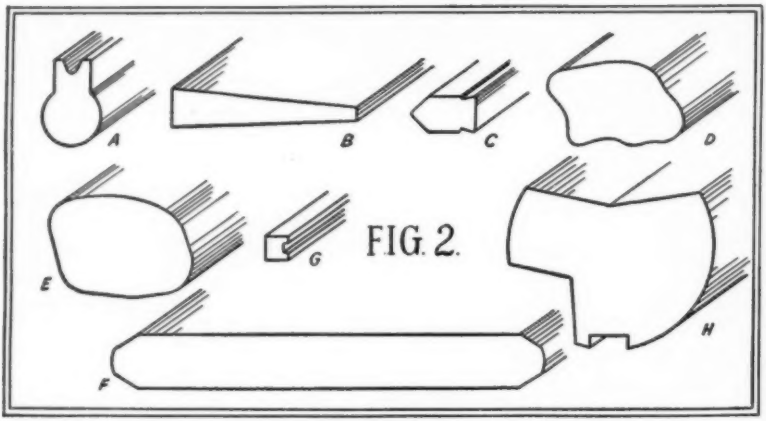

FIG. 2.

little over one quarter of an inch.

A single-groove variation is shown at C. For this section, die tolerances called for plus zero minus half a thousandth.

A keystone shape is shown at D.

Ahead of the finishing die for the part D is a breakdown die which produces the shape shown at E from round wire. Therefore the shape D is actually drawn in two stages, the second draw being from stock of the section shown at E.

A D-shaped section F is another drawing job which required holding dies to close limits—plus nothing, minus a half thousandth.

A special triangular steel shape on the small side is shown at G. Here the maximum finished dimension is only a little over 1/64".

Non-Ferrous Parts

Though steel mills have advanced quite a step in producing special shapes by the carbide die drawing process, the intricacies of shapes are nowhere near those to be found today already in drawing of brass and other non-ferrous metals with such dies. Fig. 2 shows a group of such sections.

The part shown at A is particularly striking for its intricate shape. It will be noted, here that die tolerances are held to one ten-thousandth, with all

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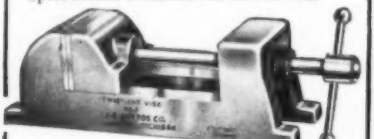

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tolerances on the plus side only.

The section shown at B is a commutator bar. Such parts are now produced in large quantities and in a variety of sizes by drawing through carbide dies. Another complicated symmetrical shape is shown at C, the part having an overall dimension of around ¼". Tolerance on all die dimensions is plus zero, minus a half thousandth.

One of the most unusual irregular shapes now drawn with carbide dies is shown at D. The various radii indicated are all specified to four decimal places. At E is shown the section of the D part as it entered the die. This shape E is also produced by drawing, holding all die dimensions to 2½ thousandths through the breakdown die. There is a considerable reduction in overall size between the parts at D and E, indicating the amount of deformation of the material.

Another minute section is shown at G in enlarged form. Maximum width of the section is only a little over 1/64", with die dimensions specified to tolerances of plus or minus 0.00025".

An irregular brass part formerly produced by milling is shown at H. It is now bench drawn to the final shape and cut into the desired short length, without needing any machining operations.

This general type of part seems to hold major promise for future increases in production by drawing with carbide dies rather than machining, as the former enables manufacturers to produce parts to extremely close tolerances and identical in every detail, resulting in parts with dimensions held to the same limits as in machining.

The latter is particularly important in progressive assembly work, where one misfit can cause much trouble.

In addition there is the not inconsiderable saving in production cost involved, which in some cases might easily mount up to 90 per cent of the original processing cost.

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Rexalloy has a high degree of toughness—superior to that of any other cast cutting tool. This superior toughness is achieved through controlled melting, pouring, etc. In toughness it is comparable to high Cobalt H. S. S. tools.

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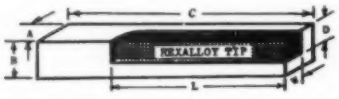

These tools have been designed to give the user a strong, flexible and economical REXALLOY tool. This type of tool can be ground by the user for either turning, facing or boring.
This strong tool construction prevents REXALLOY bits from being broken while clamping, and from snapping off due to sudden strain or shock.

TOOL	SHANK SIZE			TIP SIZE			PRICE EACH QUANTITY			
NO.	A	B	C	W	D	L	1-9	10-19	20-49	50+
A-RI	3/8	3/8	34	1/4	1/4	2 1/8	1.80	1.75	1.65	1.55
F-RI	7/16	7/16	4	1/4	1/4	2 1/8	2.15	2.00	1.90	1.80
C-RI	1/2	1/2	4	5/16	5/16	2 1/2	2.55	2.40	2.30	2.20
D-RI	5/8	5/8	4 1/2	3/8	3/8	3	3.30	3.15	3.05	2.95
E-RI	3/4	3/4	5	7/16	7/16	3 1/2	4.30	4.10	4.00	3.90
I-RI	7/8	7/8	6	1/2	1/2	4	5.50	5.30	5.15	5.00
H-RI	1	1	7	9/16	9/16	4	6.95	6.70	6.50	6.30
J-RI	1 1/4	1 1/4	7	5/8	5/8	4 1/2	9.30	8.90	8.60	8.30
K-RI	1 1/2	1 1/2	10	3/4	3/4	5	12.90	12.50	12.10	11.70
L-RI	2	2	12	1	1	5	18.95	18.40	18.95	18.85

REXALLOY SOLID TOOL BIT PRICE LIST

Size	Price	Size	Price	Size	Price
1/4 x 1/4 x 2-1/8	.60	7/16 x 7/16 x 3-1/2	2.00	3/4 x 3/4 x 5	7.20
5/16 x 5/16 x 2-1/2	.95	1/2 x 1/2 x 4	2.80	7/8 x 7/8 x 6	11.30
3/8 x 3/8 x 3	1.37	5/8 x 5/8 x 4-1/2	4.66	1 x 1 x 6	14.70

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They can also be used as roller turner tools and for form tool work.

	TOOL NO.	SHANK SIZE A	SHANK SIZE B	SHANK SIZE C	TIP SIZE D	TIP SIZE W	TIP SIZE L	PRICE EACH QUANTITY 1-4	5-9	10-19	20-
SQUARE SHANKS	C-FW	1/2	1/2	4	5/32	1/2	2	3.00	2.88	2.70	2.58
	D-FW	5/8	5/8	4 1/2	3/16	5/8	2 1/2	3.85	3.65	3.60	3.35
	E-FW	3/4	3/4	5	1/4	3/4	2 1/2	4.98	4.78	4.63	4.48
	F-FW	7/8	7/8	6	1/4	7/8	3	6.40	6.10	5.90	5.70
	H-FW	1	1	7	5/16	1	3 1/2	8.61	8.21	7.91	7.61
	J-FW	1 1/4	1 1/4	7	3/8	1 1/4	3 1/2	12.16	11.76	11.36	10.96
	K-FW	1 1/2	1 1/2	10	7/16	1 1/2	4	17.98	17.38	16.98	16.38
	L-FW	2	2	12	5/8	2	5	28.40	28.40	27.70	27.00
RECTANGULAR SHANKS	M-FW	1/2	1	7	5/16	1/2	3 1/2	5.72	5.42	5.22	5.02
	N-FW	5/8	1 1/4	8	3/8	5/8	4	8.19	7.79	7.49	7.19
	O-FW	3/4	1	8	3/8	3/4	3	8.00	7.80	7.20	7.00
	P-FW	3/4	1 1/2	8	7/16	3/4	4	10.20	9.90	9.40	9.00
	S-FW	1	1 1/4	7	3/8	1	3 1/2	10.09	9.69	9.29	8.89
	T-FW	1	1 1/2	10	7/16	1	4	12.40	11.90	11.50	11.10
	V-FW	1	2	12	5/8	1	4	16.50	15.60	15.40	14.90
	W-FW	1 1/2	2	12	5/8	1 1/2	5	24.20	23.20	22.60	21.80
	X-FW	2	2 1/2	14	3/4	2	5	33.84	32.84	32.24	31.84

APPLICATIONS—Rexalloy tools may be used on practically all machining operations such as turning, facing, boring, shaping, milling of steel, malleable iron, cast iron and non-ferrous metals. The wide variety of application with **only one grade** makes Rexallay an outstanding cutting tool for universal shop use.

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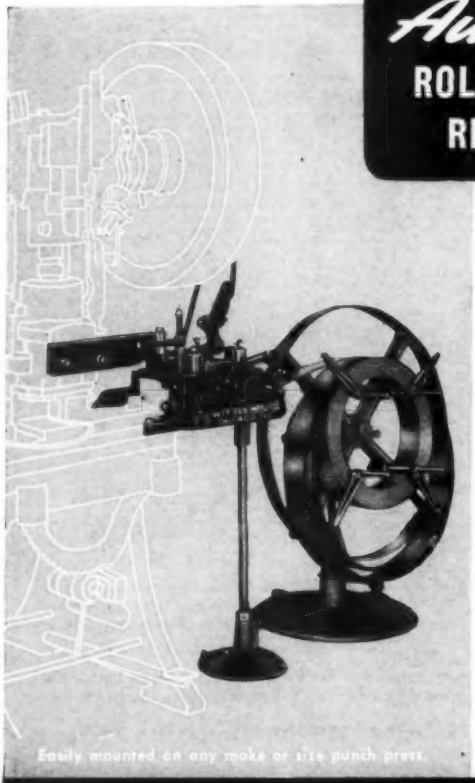

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Electric Drives for Wide Speed Range

By G. A. CALDWELL and W. H. FORMHALS

THE electrical drive for a wide speed range is obtained by the addition of a rotating regulator called a Rototrol to a conventional variable voltage system. This combination will give a speed range of 120 to 1 or more, and can be used effectively in many industries to simplify the mechanical design of the machine which it drives. Its use eliminates elaborate gear change mechanism, clutches, etc. and at the same time gives a more flexible control scheme with the complete speed range under the control of the operator without leaving the work or stopping the machine.

Residual Voltage and IR Drop Compensation

To develop a satisfactory wide range variable voltage drive, it has been necessary to compensate for certain characteristics at the low speed that are not important at high speeds. The two most important factors are the residual voltage of the generator and the IR drop of the system.

Most commercial generators have a residual voltage of between 3 and 4 per cent. This would mean that the no - load speed of a motor which is being driven from such a generator by variable voltage control is limited to a no load speed range of about 25 to 1 since the residual will not permit a voltage lower than itself to exist. If it is desirable to extend the range beyond 25 to 1, it becomes necessary to make some arrangement to overcome the residual voltage. Also, since the residual is a function of the previous magnetic history of the generator, it is necessary that the equipment used to overcome residual must be able to determine the actual conditions which exist.

The speed of the d-c motor will normally drop as load is applied due to the IR drop in the system. Since a feed mechanism must run at constant speed regardless of the load, it is necessary that the speed torque charac-

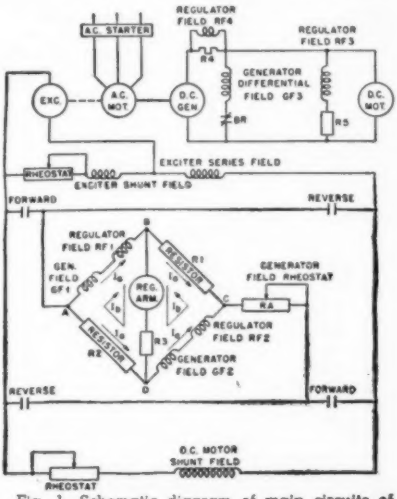


Fig. 1—Schematic diagram of main circuits of the wide speed range drive.

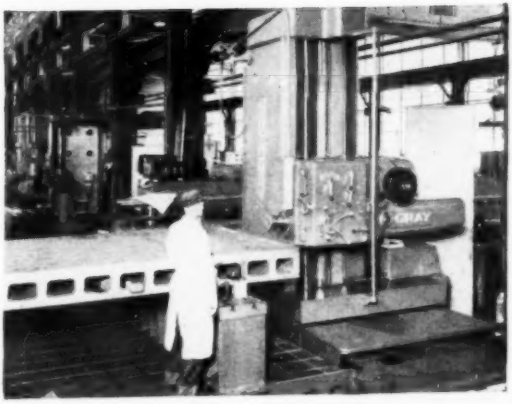


Fig. 2 — This horizontal boring, milling and drilling machine has an electrical feed drive with a speed range of 120 to 1. This speed range when obtained by electrical means eliminates the use of change gears, clutches, etc. and greatly simplifies both the construction and manipulation of the machines.

teristic of the motor driving the feed be practically flat. Since the normal drop on a d-c motor is due almost entirely to IR drop, some arrangement must be made to increase the applied voltage by the amount of the IR drop as the load is applied so that the induced voltage, and therefore the speed of the motor, will remain constant. These requirements would indicate that some means of regulation must be applied in order to maintain the desired characteristics. It has been found by experience that a rotating regulator or regulating generator is satisfactory for this particular function and has been widely applied.

Industrial Application

This type of rotating regulator was first developed for elevators and a large installation was made in Radio City in 1934. Since that time the Rototrol has been used in many industrial applications. It is the heart of the variable voltage planer drive and has been proven in service over a period of several years. Other applications include paper mill drives, electric shovels and skip hoists. In appearance it looks the same as a standard d-c generator and is usually mounted as a unit of the variable voltage M. G. set.

Control Circuit

Figure 1 shows a schematic diagram of the equipment required for a wide speed range feed equipment for a machine tool. For the purpose of simplicity, many of the control elements such as operating coils for the various contactors, control stations, etc. have been omitted. It can be seen that this circuit is basically the variable voltage system except for the addition of the regulating generator and its associated circuits. These additions however extend the range of speed adjustment and give much better regulation than can be obtained with a straightforward variable voltage system. The generator differential field CF3 and its contactor BR are a part of the variable voltage scheme which prevents creeping in the off position and are not involved in obtaining the wide speed range.

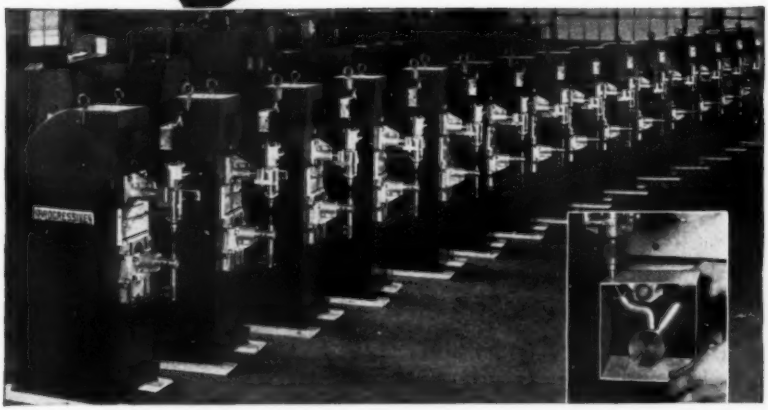
The control circuit is such that the no load speed of the motor will always be made to agree with the value desired by the setting of the generator rheostat. If mechanical load is put on the motor, it will slow down, thus decreasing its counter emf and there-

AVERAGE DELIVERY TIME

3 to 4 WEEKS!

..on PROGRESSIVE'S

PEDESTAL TYPE SPOT WELDERS



DESPITE peak production levels and peak demand for welding equipment, Progressive has been able to maintain, so far, an average delivery time of only 3 to 4 weeks on complete pedestal type spot welders, ready for use. Quantity production—*and production ahead of orders, as far as possible*—is the only way in which this could be done.

Moreover, while these pedestal welders—in capacities from 35 to 200 KVA have been in regular production, numerous improvements have been incorporated including the availability of a new and improved shunt type of head. This head is also available, if desired with an attachment permitting its being swiveled a total of 180 degrees, while the lower arm may also be obtained with a rotatable construction. These special features permit clearing of obstructions and welding at various angles, in corners, etc.

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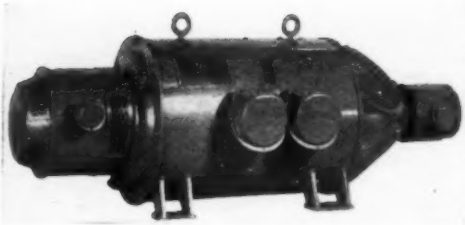


Fig. 3 — Typical variable voltage motor generator set showing the units used in a wide speed range drive. This is a four unit set with a main generator, exciter and regulating generator (on the right hand side) driven by a squirrel cage induction motor.

by permitting a current to flow in the armature circuit of the two machines. A stable point of operation occurs when the drop in speed and counter emf is just sufficient to make available enough of the generated voltage to circulate the current required.

To bring the speed back to the no load speed necessitates raising of the generator voltage by the amount of the IR drop. This is done by the regulator by adding on its magnetic structure another field RF4 which is connected in the armature circuit so as to produce cumulative ampere turns. By proper adjustment of R4 this field can cause the regulator to correct almost perfectly for IR drop and armature distortion of the motor over a wide range of load, thus giving a very flat speed-load curve.

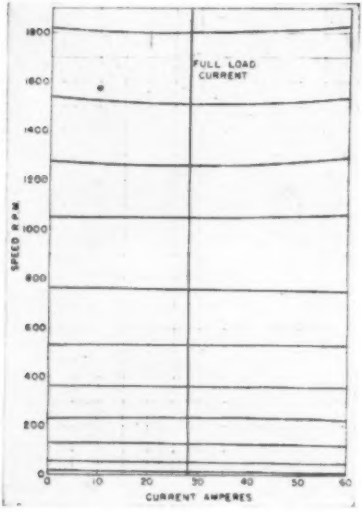
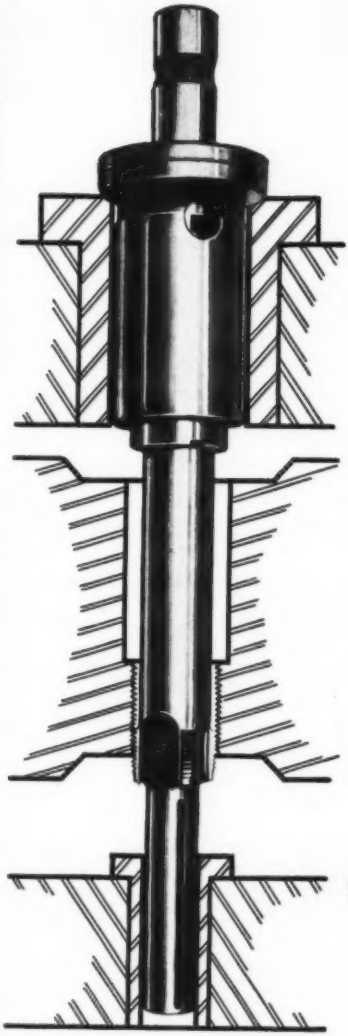


Fig. 4—Speed regulation curves covering a range from 15 rpm to 1800 rpm. Maximum speed regulation at any speed is less than 5 per cent.

Other conditions than load, tending to change the speed of the motor might be thought of, but it will be found that the regulator generator will make approximate corrections. Thus burning or shifting of the brushes of the generator often tends to cause stalling of the motor with the conventional variable drives. Also varying values of of residual magnetism in the variable voltage generator cause different voltages for the same rheostat setting. Such conditions however are corrected by the regulator.

Speed-Load Characteristics

In Figure 4 are shown the speed-load characteristics as obtained from actual tests on a 7½ hp machine tool feed equipment using a regulating generator such as just described. These curves show the regulation of the motor to double full load current over the range of from 15 rpm to 1800 rpm or a speed range of 120 to 1. Of this range, speeds up to approximately 1000 rpm are obtained by variable voltage control and from 1000 to 1800 rpm by motor field control.



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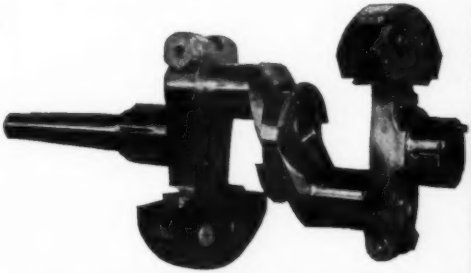

MODERN TOOL WORKS

DIVISION OF CONSOLIDATED MACHINE TOOL CORPORATION

ROCHESTER, NEW YORK

It can be seen by reference to these curves that the change in speed, due to application of load, is so small as to be negligible and there is no tendency for the motor to stall even when the speed has been reduced to 1/60th by voltage control. It is to be noted that at light loads at this speed, the voltage required is less than residual voltage of the generator. The regulator has, however, caused a reversal of current in the fields of the generator and thus bucked the voltage down to that required to get the speed desired.

From the results shown it is evident that the use of a regulator scheme such as indicated, gives a speed range far beyond the supposed limits of a few years ago without greatly complicating the electrical apparatus or going to laboratory type equipment. The machine being driven can be a simpler, more flexible and more efficient machine tool.

(Illustrations—Courtesy Westinghouse Electric & Mfg. Co.)

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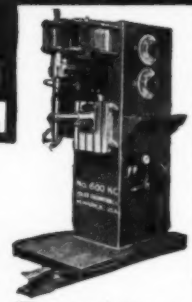

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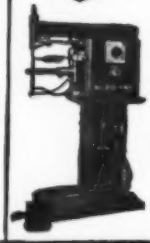

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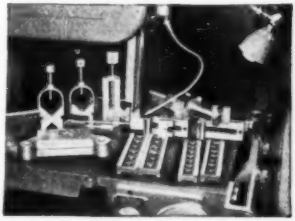

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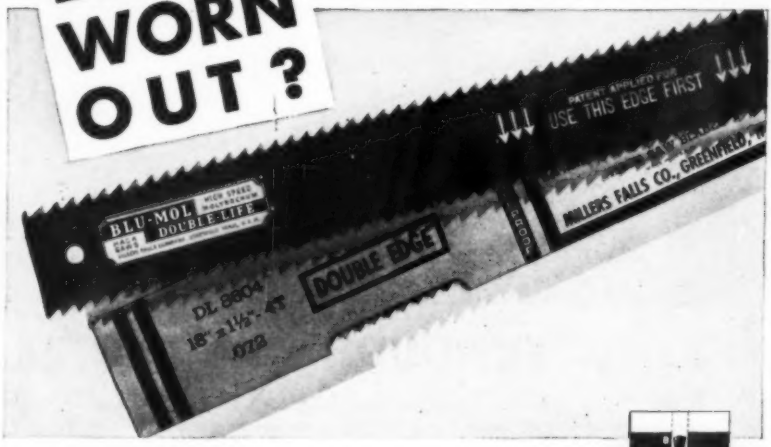

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Place in machine in usual way, first edge (A) down. As blade submerges in slot, edge B, set narrower than edge A, clears work freely, undamaged. When A is dulled, invert blade. Edge B then cuts as fast and free as first edge.

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Conserving Welding Electrodes

By CLAYTON B. HERRICK*

THE necessity of conserving materials in the war effort is nowhere more urgent than in the use of welding.

Welding is the key process which is making possible production of war ships, military planes, tanks and practically all other war equipment at the tremendous speeds which are vital to this country's speedy and complete victory.

In order that welding may contribute its utmost potentiality in war production, it is important that welding materials be utilized to maximum advantage. This applies particularly to welding electrodes.

It is the electrode which provides the metal of proper physical properties and operating characteristics, permitting production of highest quality welds in minimum time and at minimum cost.

There are a considerable number of factors which affect the most efficient use of electrodes. If conscientiously controlled, these factors will contribute to best use of welding in the war effort. The result will be a still faster rate of production by the use of welding and full utilization of the materials which welding equipment manufacturers are producing at peak capacity. The factors which have an important bearing on this situation follow:

1. Select the Right Type of Joint and be Careful of Fit-Up

There is a type of joint, (see Fig. 1) best suited to the particular job. A serious disadvantage in waste of weld metal results by using a complicated joint where the more simple type of connection will suffice. Since the type of joint greatly affects the amount of metal required, it is suggested that a study be made to insure that the joint is proper for the particular application. Obviously, the joint to select is the one which meets all requirements at the greatest speed and the lowest cost.

Joints and their fit-up should be given most careful consideration, as fit-up affects not only the cost of the welded joint as such, but also the performance of the finished product. As an illustration of the effect upon cost in a very simple fit-up, notice the case in Fig. 2, where there is shown a T-weld with ¼" plates. Assume that the cost of deposited metal is $1.00 per pound. Then if the joint is properly fitted up, the cost per foot of joint (two beads), would be 40c. If, however, there is a gap between the vertical plate and the horizontal plate of 1/16", the cost is increased to 58c per

*Welding Engineer, The Lincoln Electric Company, Cleveland, Ohio.

CONSERVATION OF WELDING ELECTRODE

TYPE OF JOINT: - Proper joint to select is the one which meets service requirements and costs the least. Obviously, if requirements are met by the simpler type of joint, which requires less machining and less electrode, it is a waste of time, labor and materials to use a more complicated type.

BUTT JOINTS

1. PLAIN BUTT JOINT. Largely used on plates up to $\frac{1}{4}$" thick with metal electrode $\frac{1}{8}$" with carbon electrode, although generally used below this. Inexpensive as to preparation of joint. Suitable for all usual load conditions if full penetration is secured.

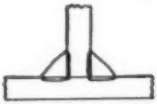
2. SINGLE V BUTT JOINT. Used largely for $\frac{1}{8}$" plate or thicker. Scarfing and machining costs more than (1) and more electrode used than in (1). Used generally on plates thicker than on (1). Meets all general or usual load conditions.

3. DOUBLE V BUTT JOINT. The cost of machining is greater but less weld metal is used than in (2). Cost of machining and welding should be balanced against each other. Used largely for $\frac{1}{2}$" and heavier, and for all usual loads. Note that joint is welded from both sides.

4. SINGLE U BUTT JOINT. Generally used on plates heavier than preceding—$\frac{1}{2}$", $\frac{5}{8}$" and over. Costs more to machine than single V but requires less electrode. Is welded from one side, except a single bead, which is put in last on opposite side. Meets all usual load conditions. Usually used for best quality work.

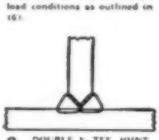
5. DOUBLE U BUTT JOINT. Used where welds can be made from both sides—on plate sizes usually heavier than in (4) and where the saving in electrode used justifies the greater machining cost as compared to double V. Used on all types of loads.

TEE JOINTS

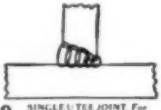


6. * PLAIN FILLET WELDED TEE JOINT. May be used for all ordinary plate sizes. No machining of plates. Most satisfactory when welds are on longitudinal shear. For welds heavily loaded transversely by fatigue or severe impact, use with caution.

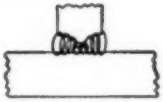
7. SINGLE V TEE JOINT. This is better than (6). For work welded from one side. Generally used on $\frac{1}{2}$" plates or lighter. Costs more for joint preparation but uses less electrode than (6). For more severe load conditions as outlined on (6).



8. DOUBLE V TEE JOINT. Used for heavy plates. Welded from both sides. Uses less electrode than (6). May be used for severe longitudinal or transverse loads of all kinds.

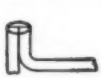


9. SINGLE U TEE JOINT. For usual size plates, generally 1" and heavier. Welded from one side only. Advisable to put in a final finish bead on side away from "U". Machining costs more but takes less electrode than single V. For same load conditions as given under single V, (7).



10. DOUBLE U TEE JOINT. For plates generally 1½" and heavier which can be welded from both sides. More expensive preparation but uses less electrode than (8). For all load conditions, even very severe.

EDGE JOINT



16. EDGE JOINT. Generally used for $\frac{1}{4}$" or thinner. Not recommended for heavier work. For loads which are not very severe.

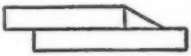
CORNER JOINTS

11. FLUSH CORNER JOINT. Generally used for 12 gauge and lighter. May be used for heavier plates with caution. Not for very severe loads on heavier plate.

12. HALF OPEN CORNER JOINT. Generally used for 12 gauge or heavier, where welded from one side only. "Shouldering" effect reduces probability of burning-through and makes for easy welding. May be used for ordinary loads, but with caution for fatigue or impact loads.

13. FULL OPEN CORNER JOINT. Used for all plate thickness when welds can be made from both sides. May be used under severe load conditions, for maximum strength.

LAP JOINTS



14. SINGLE BEAD LAP JOINT. May be used for all sizes of plates where joints are not subject to excessive fatigue or high impact loads.

15. DOUBLE BEAD LAP JOINT. Better than (14). May be used for load conditions more severe than single bead lap joint. Beads should be full size, and joints may be loaded much more severely than (14). The butt joint (3-5-9) is the best joint for very severe service but of course is more expensive.

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FIG. 1

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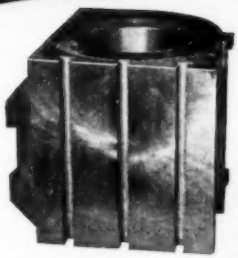
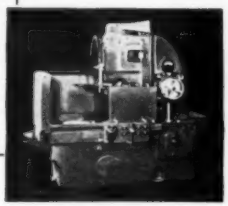
PUT IT ON THE BLANCHARD





Semi-Steel
Stock per side 1/8"
Limits ±.005"
square .001"
to .0015" in 16"

No. Sides 6
1 piece (6
surfaces)
1 hour and
35 min.

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- Fixture Saving
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THE SHAPER TABLE, 15½" x 16" x 16", illustrated here, is an excellent example of large, heavy work which may be ground with ease on a Blanchard No. 18 Surface Grinder with 6-inch extended column. These tables come to the Blanchard as rough, semi-steel castings. Six sides are ground, ⅛" stock being taken off each side.

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CONSERVATION OF WELDING ELECTRODE

FIT-UP OF JOINT:- Improper gap in plates to be joined makes a difference of .18 and .40 pounds of metal per foot of joint respectively for separations of 1/16-inch, (at center), and 1/8-inch, (at right). With proper fit-up, (at left), metal deposited per foot of joint is .40-pound.

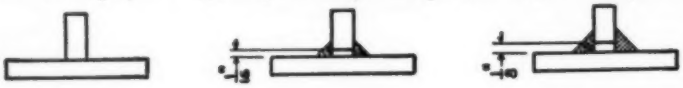

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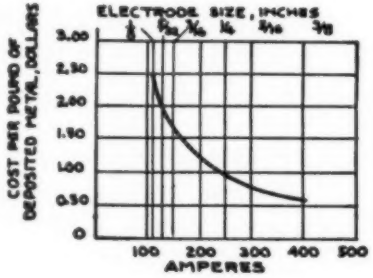
FIG. 2

CONSERVATION OF WELDING ELECTRODE



ELECTRODE SIZE:- Effect of electrode size on economy is shown in the chart at left and table below. Note how the cost of welding goes down as electrode size goes up. Note, also, electrode consumption rate, pounds of electrode deposited per hour, number of stub ends, (indicated by interruptions per pound consumed), and cost of interruptions to change electrodes.

EFFECT OF CHANGING ELECTRODE SIZE

ELECTRODE SIZE	1/8	5/32	3/16	1/4	5/16	3/8
AMPERES	110	130	190	250	325	425
ARC VOLTS	24	25	26	30	34	38
K.W. AT ARC	2.64	3.25	3.9	7.5	11.1	16.1
CONSUMPTION RATE, LBS. PER HR.	2.6	3.3	3.95	7.5	10.7	16.2
DEPOSIT, LBS. PER HR. (50% OPERATING FACTOR	0.87	1.1	1.32	2.5	3.57	5.4
EFFICIENCY OF SET (%)	47	50	51	55	59	59
KILOWATT INPUT	5.6	6.5	7.65	13.65	18.8	27.3
INTERRUPTIONS PER LB. CONSUMED	18	12	8	5	3	2

COST PER POUND DEPOSITED

LABOR	$1.180	$0.909	$0.758	$0.400	$0.280	$0.185
OVERHEAD	1.180	.909	.758	.400	.280	.185
POWER	.044	.039	.038	.033	.033	.031
ELECTRODE	.150	.135	.127	.127	.127	.127
COST OF INTERRUPTION (INCLUDING OVERHEAD)	.030	.033	.022	.016	.008	.005
	$2.584	$2.045	$1.723	$0.996	$0.748	$0.553

COURTESY THE LINCOLN ELECTRIC COMPANY

FIG. 3

THE GLENCO

Utility Tools

COMPENSATING TOOL HOLDER

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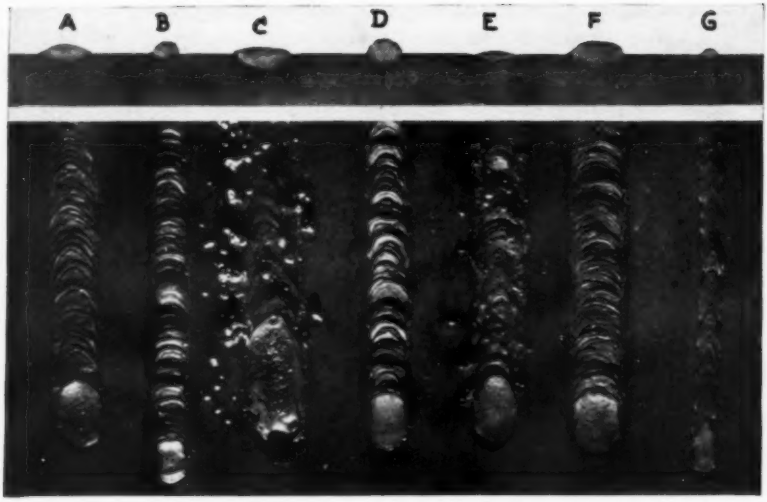

Fig. 4—Plain and elevation views of welds made with shielded arc electrode under various conditions:—(A), current, voltage and speed normal; (B), current too low; (C), current too high; (D), voltage too low; (E), Voltage too high; (F), speed too low; (G), speed too high.

foot. If this discrepancy is ¼", the cost is increased to 80c per foot, resulting in a difference of 18 to 40c for 1/16" and ¼" respectively. Obviously money spent in obtaining good fit-up is readily saved in welding.

Lbs./Ft of Joint	.40	.58	.80
Cost/Ft	$0.40	0.58	0.80
Increase in Cost		$0.18	0.40

2. Choose the Correct Type of Electrode

While the general purpose electrode will produce satisfactory welds under virtually every condition, special electrodes, as for example, heavily coated fast flowing types would prove more efficient. The electrode should be chosen with respect to:—(a) physical properties required; (b) type of joint; (c) position of welding, that is, flat, vertical, overhead or horizontal; and (d) condition of fit-up of the work. Recommendations of the equipment manufacturer should be considered.

3. Use an Electrode Which Has and Maintains a Uniform Coating

The electrode coating, if not correct, will cause rejects not only of the electrodes themselves but possibly of the welds produced by their use. It should be remembered that the coating not only produces the protecting shield but it also controls:—(1) fluidity of the metal; (2) penetration; (3) shape of the beads; (4) physical properties of the deposit; and (5) composition of the deposit.

4. Use Electrodes Which Provide Proper Physical Properties

Electrodes manufactured today are clearly described by the manufacturer in respect to the quality of weld they will produce. Required physical properties of the work at hand should be known and the electrode should be selected to meet these requirements.

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5. Use Fast Flowing Electrodes Wherever Possible

Certain electrodes are manufactured today to permit the fastest possible welding under specified conditions. It is obvious, therefore, that electrode and, hence, time will be saved if these fast flowing types are used wherever practical.

6. Select an Electrode Which Keeps Splatter and Slag Loss at a Minimum

Since all splatter is a waste of weld metal, the importance of this is obvious. It should be realized that the splatter loss of the electrodes vary and care should be taken to avoid use of those which have excessive losses.

7. Wherever Possible Use Electrodes Which Produce Flat Beads

It is a waste of welding electrode to deposit any more metal than is required. Not only is the welding electrode itself wasted but useless time is required to remove the excess metal from the welded joint.

8. Select the Right Size Electrode

The largest diameter electrode which can be used effectively is the best from the standpoint of electrode conservation. The saving runs up to 40% per pound deposited, for example, when ¼" is used instead of 3/16". (See Figure 3).

9. Use Long Electrodes in the Larger Size

The obvious result is the reduction in the number of stub ends and in the time saved by eliminating interruptions to change rods. The 18" length should be used in ¼" and larger sizes.

10. Do Not Bend Electrodes

This generally unnecessary habit will waste from ¼ to 1/3 of the electrode. Use electrodes straight and get the maximum of deposited weld metal from each rod.

CONSERVATION OF WELDING ELECTRODE

PROPER PROCEDURE: - Characteristics of welds are a good check on electrode conservation. The effect of varying one factor in procedure is indicated below. Note what happens to electrode burn-off rate, weld penetration, appearance of weld and arc sound when the three factors of "arc current", "arc volts" and "arc speed" are varied from "normal".

RESULTING WELD CHARACTERISTICS (SEE FIG. 6)

	"F"	"A"	"B"	"C"	"D"	"E"	"G"
ARC CURRENT	NORMAL	LOW	HIGH	NORMAL	NORMAL	NORMAL	NORMAL
ARC VOLTS	NORMAL	NORMAL	NORMAL	LOW	HIGH	NORMAL	NORMAL
ARC SPEED	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	LOW	HIGH
BURN OFF OF ELECTRODE	NORMAL APPEARANCE COATING BURNS EVENLY	PRACTICALLY SAME AS PRECEDING	COATING IS CONSUMED AT IRREGULAR HIGH RATE-WATCH CAREFULLY	COATING TOO CLOSE TO CENTER TOUCHES MOLTEN METAL RESULTING IN POROSITY	DROPS AT END OF ELECTRODE FLUTTER AND THEN DROP INTO CRATER	NORMAL	NORMAL
PENETRATION FUSION (CRATER)	FAIRLY DEEP AND WELL DEFINED	NOT VERY DEEP NOR WELL DEFINED	DEEP, LONG CRATER	SMALL	WIDE AND RATHER DEEP	CRATER NORMAL	SMALL, RATHER WELL-DEFINED CRATER
APPEARANCE OF BEAD	EXCELLENT FUSION-NO OVERLAP	ON TOP OF PLATE, NOT AS MUCH OVERLAP AS WITH BARE ROD.	BROAD, THIN BEAD-GOOD FUSION	HIGH BEAD NOT AS PRONOUNCED AS FOR LOW ARCS, SOMEWHAT BROADER	WIDE SPATTERED	WIDE BEAD-OVERLAP LARGE BASE METAL AND BEAD EXCESSIVELY HEATED	SMALL BEAD-UNDERCUT-REDUCTION IN BEAD SIZE AND UNDER CUTTING DEPENDS ON SPEED AND AMPERES
ARC SOUND	SPUTTERING HISS PLUS SHARP CRACKLING	IRREGULAR SPUTTERING, SOME CRACKLING	REGULAR EXPLOSIVE SOUNDS	HISS PLUS STEADY SPUTTER	SOFT SOUND PLUS HISS AND FEW CRACKLES	NORMAL	NORMAL

COURTESY THE LINCOLN ELECTRIC COMPANY

FIG. 5

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Timken Bearing—Self-Locking Turret—Infinite Spindle Speeds

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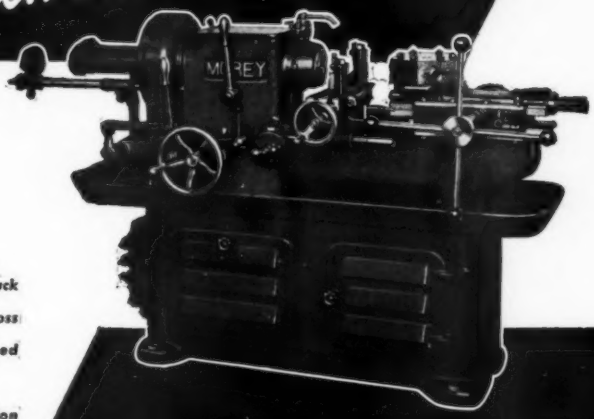

CAPACITY
Automatic Chuck (round) 1"
Swing over cross slide 6"
Swing over bed 14"

Full description and detailed illustrations are shown in Bulletin 629. Ask for it TODAY!

Join the parade of high speed defense producers with the MOREY 2G *Timken Bearing* Turret Lathe, with *Self-Locking Turret*. You are assured *vibrationless precision* with an *infinite variety* of spindle speeds for every job. It's designed to take full advantage of *high speed and carbide tools*. Back gears are instantly thrown in through *extra large* Twin Disc Clutch. *Can be furnished with Tooling!*

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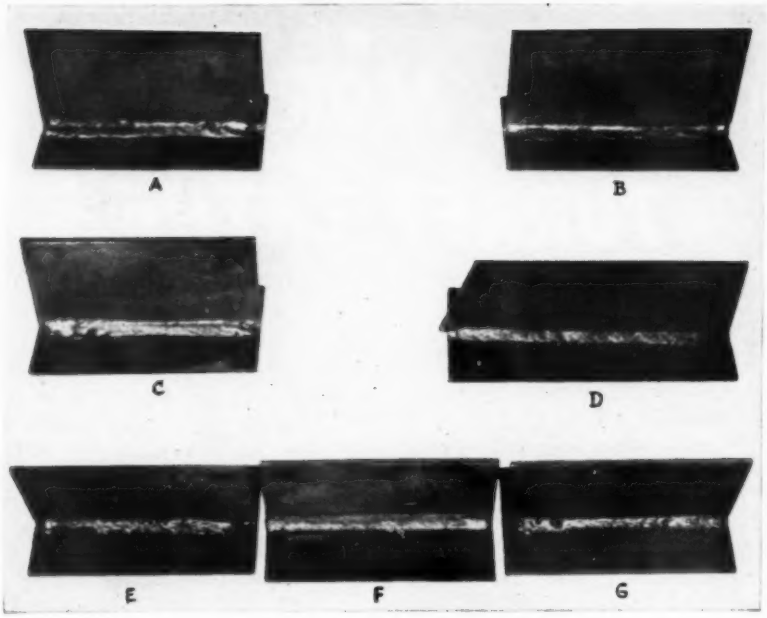


Fig. 6—Fillet welds made with shielded arc electrode under various conditions:—(F), current voltage and speed normal; (A), current too low; (B), current too high; (C), voltage too low; (D), voltage too high; (E), speed too low; (G), speed too high.

11. Use Proper Voltage and Current Settings

Every electrode manufactured is designed to operate at a certain voltage and within a specified current range. If current is too high or too low, it will manifest itself either in excessive splatter loss or inferior welds, (see Figure 4), having improper fusion and penetration. (Also see Figures 5 and 6).

12. Follow the Procedure Specified For the Electrode

Accompanying each different electrode manufactured are detailed specifications regarding procedures to be followed. These specifications have been prepared carefully by the electrode manufacturer and, if followed consistently, will prevent waste of electrode and assure high quality welding.

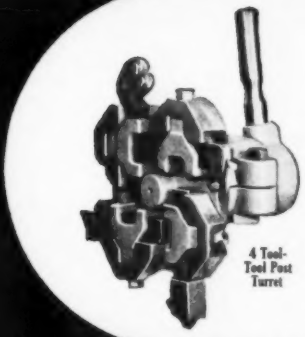
13. Avoid Using an Excessive Number of Beads

If one bead of weld metal will meet design requirements, it is obviously a waste of electrode to add additional beads. This same applies to applications where two beads suffice. Additional beads are simply a useless waste of electrode.

14. Use Electrode Down to Minimum Stub End

Remember that the electrode can be used the entire length of its coated surface. Leaving any more than a minimum stub end is an obvious waste. By using care in gripping the electrode at its extreme end in the holder and burning it down to the maximum

JEFFERSON *BULL DOG* MILLING MACHINE



4 Tool-Tool Post Turret

JEFFERSON

4—TOOL TOOL POST TURRET
5—TOOL TAILSTOCK TURRET

You can convert any engine lathe into a complete precision turret lathe with the Jefferson 4-tool tool post turret, 5-tool tailstock turret and Adjustable Pull Feed—and double its capacity. For forming, roughing, boring, finishing, drilling, tapping, etc.

The tailstock turret is made in four sizes to fit small bench lathes up to lathes with 20" swing. The tool post turret is made in 2 sizes.

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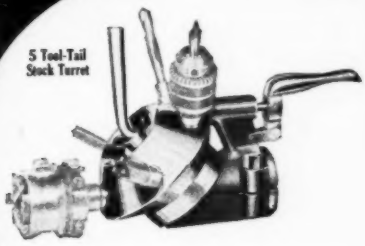

5 Tool-Tail Stock Turret

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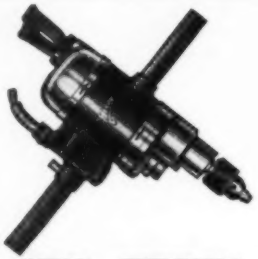

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extent, the operator is rendering a patriotic service in saving electrode. Just ½" difference in stub end saves 3½% on an 18" length rod.

15. Collect and Save Stub Ends of Electrode

At the rate at which welding is being used today in war production, the amount of metal which would be wasted by failure to save stub ends would be tremendous. The average stub end is 2" long and this length multiplied by the millions of electrodes used, would constitute a great loss.

16. Use Modern High Capacity Welding Generator

Welding generators manufactured today have much higher capacity and much greater efficiency. For example, a modern 40-volt generator was shown to produce 7.7" of joint per electrode as against 6.6" for an older machine.

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Cross section of Tru-Grip Tap Holder showing positive drive to tap.

If you want to reduce your tapping costs

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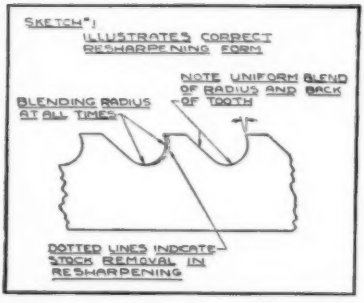
"Let's Talk Shop!"

Extending Broach Life

By Harry Gotberg, Chief Engineer, Colonial Broach Co., Detroit.

METHODS whereby life of broaches may be extended, are becoming increasingly important at this time when defense production is creating tool shortages in almost every industry. The service life of broaches has a very direct and often pronounced effect, not only upon the cost per piece, but more important—the speed with which needed defense parts and equipment may be produced.

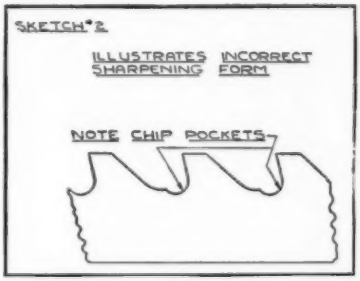
Even though cost may not be so much of a factor today, the production delay involved in making a new broach to replace one spoiled in service may be vitally important. Further, both the broach advantages of inherent lower cost per piece and of higher productive speed may be lost if the service life of the broach is reduced for any controllable reasons.


SKETCH #1
ILLUSTRATES CORRECT RESHARPENING FORM
NOTE UNIFORM BLEND OF RADIUS AND BACK OF TOOTH
BLENDING RADIUS AT ALL TIMES
DOTTED LINES INDICATE STOCK REMOVAL IN RESHARPENING

Obtaining longer service life from broaches involves two factors:—proper sharpening, and proper storage and handling. The matter of broach sharpening should be approached from the standpoint that the job should equal that done when the cutting edges of the broach are initially formed at the broach maker's plant. Similarly, after receipt by the user, broaches should be handled and stored just as carefully as they are prior to shipment to him.

Broach Storage

Since broaches are generally made from hardened high speed steel and may be equipped with sections of tungsten carbide, the cutting edges of the teeth will easily chip or become nicked if the broach is dropped on a hard surface, or otherwise carelessly handled. Individual storage pockets or bins should always be provided to prevent the cutting edge of the teeth of several broaches from striking against one another. The compartments of the bin should also be of a material, or have a lining that will protect the teeth from damage.



Broach Sharpening

Obtaining reproduction of original quality in a re-sharpened broach implies the necessity of using special equipment developed for the purpose. Makeshift equipment cannot be expected to produce the accuracy and finish obtained with special broach sharpening machines, such as shown in Fig. 1. Sharpening equipment should be kept in accurate condition

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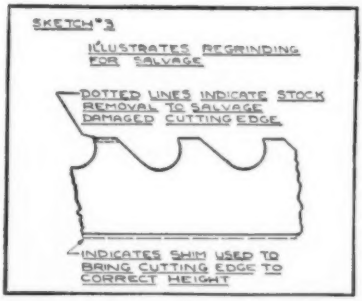
and operated by men familiar with the essential requirements of the broach sharpening operation.

Satisfactory broach performance and service life can be obtained only if the cutting edges are maintained as originally designed. Any excessive departure from the original size and form of the teeth will cause incorrect action of the teeth and may result in irreparable damage.


SKETCH "3
ILLUSTRATES REGRINDING FOR SALVAGE
DOTTED LINES INDICATE STOCK REMOVAL TO SALVAGE DAMAGED CUTTING EDGE
INDICATES SHIM USED TO BRING CUTTING EDGE TO CORRECT HEIGHT

Sketch No. 1 illustrates the proper method of sharpening. Notice that the correct form and contour of the teeth are maintained by this procedure. This form permits the chip to curl and clear itself from the edge of the tooth that is in cutting position. This illustration also indicates the effect of successive sharpenings as well as the proper chip form. In any case of doubt as to the correct tooth form, the blueprint of the broach should be used as a guide.

Sketch No. 2 shows the improper method of sharpening. The tooth contour has not been maintained. The edge of the grinding wheel has produced a groove below the proper curvature of the tooth form, thus creating a "pocket" which will prevent the chip from clearing the point of the tooth. Chips will "load up" in the pocket, decreasing the distance normally available for chip clearance. Robbing the teeth of full chip clearance may cause the broach to break. This is especially true in broaching steel parts where a continuous chip is produced.

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WHEN you are confronted with an urgent need for increased productive capacity in connection with the U. S. armament program—this powerful, accurate Delta Cut-Off Machine can help you where materials have to be cut to accurate length on a production basis. It can be used for hundreds of operations now performed by costlier machines — or being done by hand at high cost. Available at about one-half the usual price of machines of this type.

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No. 1631-C Cut-Off Machine

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Broach Finish

A smooth finish on the teeth of a broach is essential to smooth surface finish of the broached part. It permits the chip to move freely along the surface of the entire tooth form and will create a "natural" rounded chip, alllowing maximum chip space between the teeth. A smooth surface finish on the broach teeth will also help to produce a greater number of parts between sharpenings, since there is less tendency to break down the cutting edges of the teeth than when the edges are rough.

Broach Reconditioning

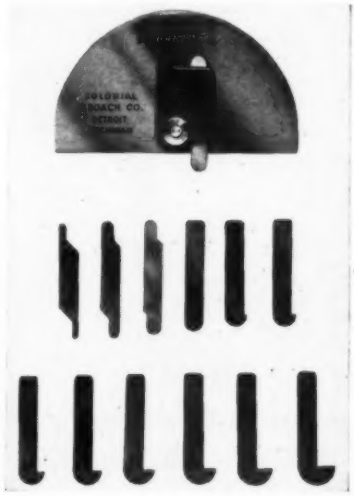
On surface broaches designed for use in a broach holder or so that adjustment or "shimming" to a new height is allowed, the teeth can be reconditioned by re-stepping and re-backing off on top of the tooth form as shown in Sketch No. 3.

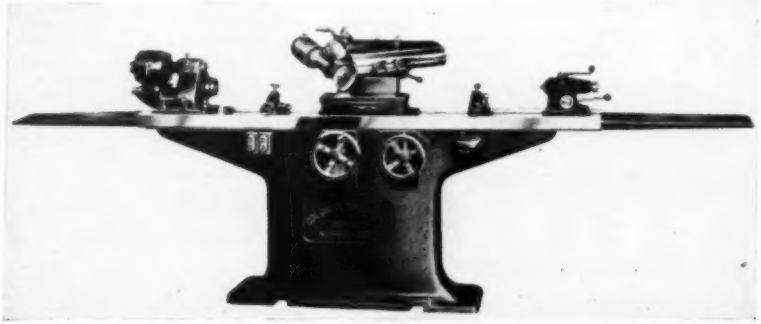
This operation requires extreme care, since the proper stepping, backing off and tooth depth must be maintained. Usually the broach should be sent to the maker for this work, since the machines employed for originally producing the broach can be utilized and the broach brought back to its initial condition at nominal expense.

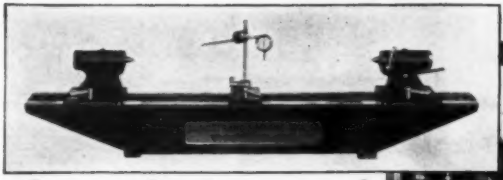
Often damaged broaches can be "salvaged" from sections which have one or two broken teeth or when a section has been resharpened to a point where the width of the teeth will not allow additional sharpenings.

Broach Checking

Illustration No. 4 shows a type of Hook and Radius Gage suitable for checking the correct radii at the bottom of the tooth form and the correct hook angle. Gages of this kind are virtually necessary in maintaining broaches at peak efficiency and are a material aid in preventing damage from improper sharpening. A modern broach sharpening machine is shown below.







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For Rapid Checking Between Centers

Ask For Bulletin SBT-436

Sundstrand Bench Centers and Balancing Tools are fully described in bulletin illustrated; with capacities, weights, other data. Ask for Bulletin SBT-436.

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DEALERS — Sundstrand Open Line Tools offer many opportunities to help customers and build profitable sales; include Balancing Tools and Manual Index Bases, besides Bench Centers shown above. Information on request.

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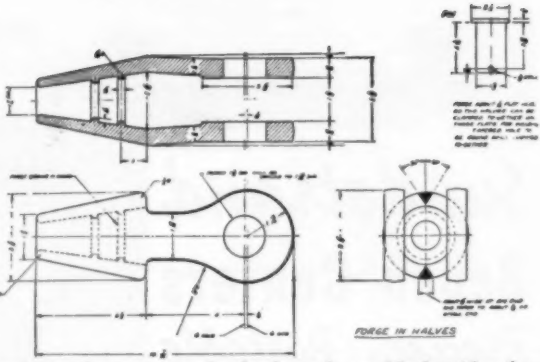
Cable Sockets



Keeping every available piece of equipment working 24 hours every day on war production beats the Jap-Germ. When work began to lag in the weldery and machine shop of Mississippi Valley Barge Line Co., Cincinnati, a supplementary production of cable sockets for wire cable was inaugurated to "keep 'em rolling." In fact, an improvement was made over all previous methods of construction.

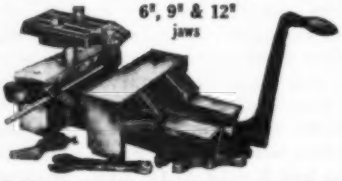
Formerly, all sockets were forged into one piece. This method required an expensive die and involved a number of time-taking operations.

In the experimental stages, a ¾" plate was burned out to the proper shape; drawn out thin on one end in a simple form by a blacksmith; then heated and the cone formed in another simple shape. Two pieces, of course, were made exactly alike. Finally, these pieces were beveled and the two halves welded together. This new method permitted forging of the two rings in the cone to prevent the zinc from backing out. Former methods of construction required machining of the solid cone for placement of the zinc.

The method proved so successful that this company has decided to work a die for forging the halves for speedy production. Then the only remaining operations will involve welding the halves together; touching up the weld on the grinder; and running a drill through the holes. Drawing, supplied by Hobart Brothers Co., Troy, Ohio, gives full details.

GRAHAM MULTI-PURPOSE VISE

6", 9" & 12" jaws



Sold with or without Jig Attachments which make the vise an all-purpose jig for miller, driller, planer, shaper, grinder. Finished flush to accurate parallels and right angles. PROMPT SHIPMENT.

KNURL HOLDER FOR LATHE TURRET

A unique tool, adjustable to make many patterns of straight, spiral and checkered knurling all with the same pair of straight-cut knurls. Shank to fit your turret. PROMPT SHIPMENT.

REQUEST CIRCULARS AND PRICES.

GRAHAM MFG. CO., INC.
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Scrap Salvage

With the conviction growing in industry that continuing supplies of materials can best be assured by minimizing waste and spoilage, and then speeding the return to the producing plant of all unavoidable scrap, the views on this subject of an industrial organization that pioneered some 25 years ago in reclamation and salvage should be of more than ordinary interest.

According to the Western Electric Company, who handle not only the waste materials originating in their own manufacturing operations, but the

WE FABRICATE STAINLESS (all types) Aluminum, Monel, Brass, Copper, Angle and Bar Shapes.

Yes sir!

KIRK & BLUM *wants your* SHEET STEEL and LIGHT PLATE WORK

We have been specializing in sheet metal fabrication for more than a third of a century. With expanded modern plant facilities, manned by experts, we can design, manufacture and assemble your sheet, steel and light plate work from a single piece, to quantities on production basis—with speed and economy.

Time is precious. National Defense orders are demanding greater production. Meet these conditions by sub-contracting your sheet metal work to Kirk & Blum and get results; faster delivery schedules, reduced costs, improved products and release of men for other important work. Many industries have found Kirk & Blum Service helps them to do all this.

Investigate this service. Send us your blue prints for prompt quotations. Our engineering staff is available to help solve your problems.

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COSTLY REPAIRS AND LOST PRODUCTION TIME

Today—more than ever, you cannot afford costly breakdowns of vital machinery, nor loss of man hours of work due to "abrasive dust" in your plant.

Trap this "dust menace" right at the source as it comes off grinding and buffing wheels with Torit Self-contained Dust Collectors.

You'll SAVE not only costly repairs, but initial installation and operating cost, because Torits are portable units—easily placed near dust sources—and economical to operate because suction is provided only when machines are operating.

Torit Dust Collectors are available in sizes to fit your requirements. *Write today for bulletin giving Torit features, specifications and prices.*

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303 Walnut St.
St. Paul, Minn.

TORIT
Dust Collectors
SELF-CONTAINED UNITS

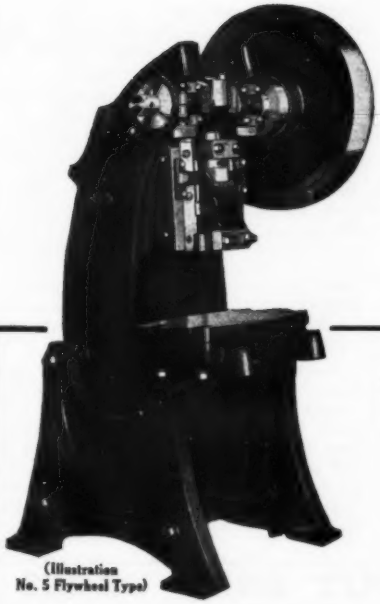
non-ferrous scrap of the vast Bell system as well, the fundamental secret of successful reclamation is identification and segregation of material. To those in command of these operations for Western Electric, it appears obvious that this sorting should start at the scrap source—in the shop. According to these authorities, only in this way can utilization to the best advantage be assured. Indicative of results that may be expected from vigorous salvage action is the experience of a large steel producer that recently completed a brief but well organized house cleaning drive in all its plants. Results were most gratifying. Well over 100 carloads of iron and steel scrap were accumulated. Averaging 25 long tons per car this haul, at $15.00 per ton, average delivered price under the Office of Price Administration schedule for scrap of this kind, had a value in excess of $50,000. More important, however, from the point of view of the steel producer, this scrap permitted the production of four times that tonnage of open hearth ingots. Thus well over 10,000 long tons of badly needed steel was made available to the war program.

Key to the success of this drive was the appointment in each plant of scrapping committees made up of "Top Side" men, including in each case the plant superintendent, using as their guiding policy the slogan that, with the odd exception that proves the rule, any piece of equipment that is not being used today will never be used and should be scrapped and with full discretion and final judgment in their hands, prompt action was assured.

(Courtesy—Nickel Steel Topics—published by The International Nickel Co., Inc., N. Y.)

Split Core Current Transformer

A new split core current transformer is now available to engineers and maintenance men for testing power circuits. The "All out" war effort, calling for increased speed and more productive output per man per machine, can be aided by rapid and accurate testing of a-c circuits, feeding important motor driven processes, ma-



(Illustration
No. 5 Flywheel Type)

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MARSHALLTOWN MFG. CO.
900 E. NEVADA ST., MARSHALLTOWN, IOWA

chine tools and other electrically operated equipment. Such tests supply valuable information as to control, condition, and efficiency of operator and machine.

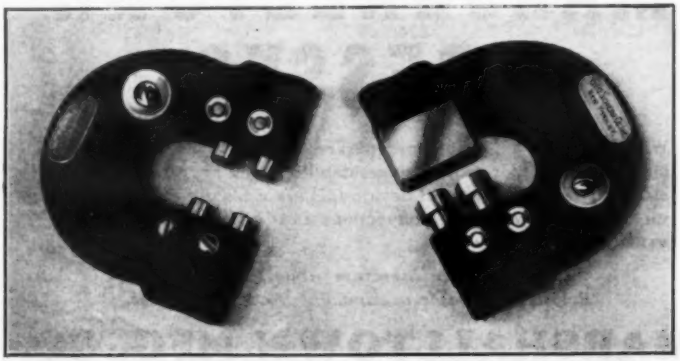
In many instances, it is difficult or impractical to open power circuits to conduct such tests. The use of a split type transformer eliminates necessity of opening any circuit in question, whether it's carrying load or not. It is only necessary to connect instrument to transformer's secondary terminals and close its separable core around the circuits's cable or buss to effect a reading.

One of the new and important features claimed for these split core current transformers is that their accuracy is practically independent of the tightness of closing magnetic core. Fig. 1, showing the right angle, interleaved core construction, helps explain why the separable core may be lifted open as much as ¼" from "closed" position, without appreciably effecting instrument reading. This feature permits metering of both watt and ampere loads at sufficiently high accuracy for all general testing.

Another important feature is that these new transformers also operate instruments drawing heavy volt ampere loads such as recording ammeters and wattmeters, as illustrated in Fig. 2. A graphic record of a sequence of operations often reveals unsuspected information as compared with observations of indicating instruments.

ADJUSTABLE LIMIT SNAP GAGES

Many plants engaged in war work are using Adjustable Limit Snap Gages to quickly and accurately measure mass produced parts urgently required. Atlantic Adjustable Limit Snap Gages are manufactured to American Gage Design Standards. Write today for folder. Prompt deliveries in most sizes.



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GEORGE SCHERR CO., 122 Lafayette St., New York, N. Y.

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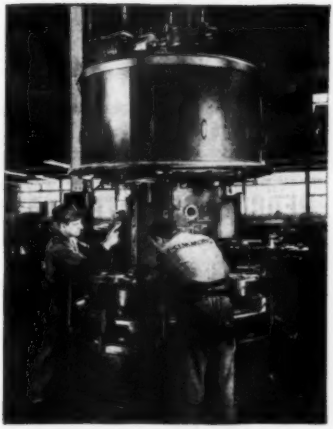
The Simmons Machine Tool Corporation is helping industrialists all over the country to get unused hours out of their machine tools through Engineered Rebuilding. It may be that "The Simmons Way" can help you step up production in your plant.

Send For This Book TODAY

This 58-page book: "The Simmons Way of Engineered Machine Tool Rebuilding," will show you how to make the most of what you have. A request on your company's letterhead will place it on your desk.



BULLARD MULT-AU-MATIC getting final adjustments after rebuilding in the Simmons plant. This machine, one of the most intricate of the larger machine tools, was completely dismantled and rebuilt from the ground up. New parts were supplied to replace those badly worn, broken or missing.

Write for a Rebuilding Estimate on YOUR Machine tools.

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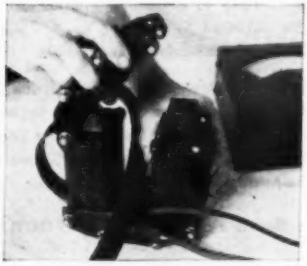
TAKE THE DUST OUT OF INDUSTRY

TORNADO

When transformer is closed over a conductor, as illustrated in Fig. 3, there is a choice of three primary current ranges: — 150-300-600 amperes, the secondary current being 5 amperes. If conductor is looped, so it passes through the opening twice, full scale primary current ranges are 75-150-300 amperes. If conductor is passed through three times, primary current will be 50-100-150 amperes. All three methods of connecting the transformer are equally accurate.



The transformers are compensated for a 10-volt ampere instrument burden, an average for recording instruments. Due to inherent ratio stability, other instrument burdens may be used with a slight reduction in accuracy. Other primary current ranges (up to 1000 amperes), instrument burden compensation, as well as the furnishing of ratio and phase angle curves are available on special order. For maximum accuracy, however, transformers should be ordered compensated for their proper instrument burden.

REDUCE REJECTED PARTS with Postel Filing Machines

Cut precision angles or to exact lines—with a machine that is accurate because table locks positively and the file is fixed in its stroke up and down. Made so work may be removed for inspection and returned without readjustment. Saves time because it is easy to "set up".

CHECK the FACTS—WRITE FOR A BULLETIN!

Scotch-yoke action—piston type—hardened pins—runs in bath of oil. Hardened crank shaft pin. No die casting — built to do production filing. Capacities are large allowing adaptation to jobs that required more expensive machines.

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Compensate for TOOL WEAR and UNEQUAL TOOL LENGTHS on single and multiple spindle jobs with MIDWEST ADJUSTABLE EXTENSION HOLDERS

MIDWEST ADJUSTABLE EXTENSION TOOL HOLDERS in use for FINISH REAMING Operation on Cylinder Blocks in a Detroit Automotive Plant

- ADJUSTMENTS CAN BE MADE IN STEPS OF .001 OF AN INCH.
- OPERATOR CAN MAKE ADJUSTMENTS BY HAND—NO TOOLS NEEDED.
- SET-UP TIME IS REDUCED.
- DESIGN IS SIMPLE, CONSTRUCTION RUGGED. ALIGNMENT ACCURATE.

HERE'S HOW THEY WORK

Midwest holders are provided with an extremely accurate, ground fit between the sleeve and the shank. A knurled, graduated collar which controls the adjustment is located at the top of the sleeve. A key fixed in the sleeve, with a sliding fit to a keyway in the shank provide a positive drive.

Micrometer, longitudinal adjustment steps of .001 of an inch are made by turning the collar one space on the bevelled edge, graduated scale. The collar holds firmly at all positions of the scale. There are no screws or locknuts to give trouble and, without tools of any kind, the operator can easily make the adjustment by hand.

MIDWEST TOOL & MFG. CO. • 2382 W. Jefferson • Detroit, Mich.

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SPECIAL TOOLS • REAMERS • FORM TOOLS
CARBIDE TIPPED TOOLS • ADJUSTABLE HOLDERS

Precision METAL CUTTING TOOLS

MIDWEST

LOOK AT THIS CHIP!

A 2-inch diameter drill in a Universal collet chuck turning only 160 revolutions per minute cut the chip here illustrated. And during this drilling operaton the drill did not slip in either a longitudinal or radial direction in the collet chuck. In addition to gripping as strong as solid steel itself. Universal chucks have ground threads and ample room for tool feed out. Write for further facts and prices.

UNIVERSAL

Engineering Company

Frankenmuth, Mich.

The secondary windings and interconnecting leads are well insulated and protected from mechanical injury. Windings are tested at 2500 volts to ground for one minute. This insures ample protection when working on 110-220-440 volt power circuits. The transformers may be used on circuits of any voltage providing conductor is properly insulated before placing transformer in position.

Dimensions of the opening through the transformer case are full 1-9/16"x 3⅛"; large enough to accommodate two 1,000,000 circular mill rubber or lead covered cables, or a 3" buss structure. Rigid, interleaved core construction is said to assure constant accuracy and long life. Engraved terminal boards are of black bakelite with brass secondary terminals. Hinged, magnetic yoke furnished with lock pin, allows the transformer to be sealed "closed" during test. Transformer weighs only 12 pounds and is easily carried by the strap leather handle.

Delivery schedules average around two weeks. Due to the fact that practically all materials used in construction of the transformers are on the critical list, it is necessary that orders carry priority ratings. New literature will be mailed upon request by R. B. Annis Co., Indianapolis, Ind.

Recommended Levels of Illumination

The illumination table listed below for iron and steel manufacture is the result of recent findings and observations by the Westinghouse Lamp Division, Bloomfield, N. J.

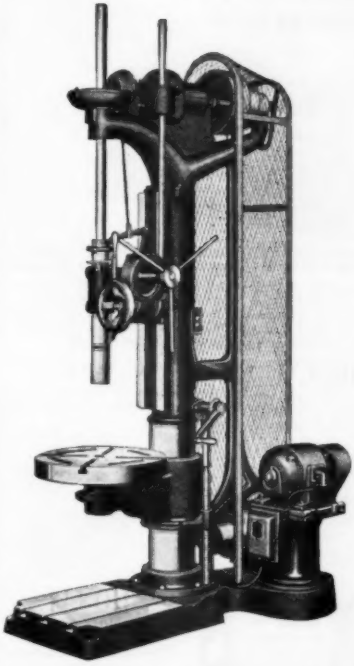
It is based on the scientific fact that existing foot-candle levels should be at least doubled if measurable and significant improvements in seeing are to to result. In addition, the new recommendations give full weight to the improvements in old light sources, the high efficiencies of the new, and the ever downward trend of lighting costs as a result of all these improvements. The values shown should be provided on the work regardless of whether in a horizontal, vertical or oblique plane.

Step Up WAR PRODUCTION

ON *Sibley* 24" SLIDING HEAD DRILLING MACHINES

● Sibley drill presses are designed for fast, accurate, economical production. Used in hundreds of America's leading plants. Simplified design makes it easy to operate for inexperienced help. Its accuracy assures tool room jobs to the very closest tolerances.

Available in 24" and 28" swing; with round or square table; coolant pump; mechanical tapping attachment; V-flat motor drive or geared motor drive.



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Denver, Colo.....Mine & Smelter Supply Company
Detroit, Mich.....James W. George Mach. Company
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Los Angeles, Cal.....Eccles & Davies Mach. Company
Melbourne, Florida.....William Kath
Milwaukee, Wis.....E. L. Essley Machinery Company
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New Orleans, La.....Murray Baker Frederic, Inc.
New York, N. Y.....Vandyck Churchill Company
Philadelphia, Pa.....Swind Machinery Company
Pittsburgh, Pa.....Barney Machinery Company
Portland, Oregon.....Portland Machinery Company
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Three interchangeable inserts for all kinds of centered and uncentered work. Save hours on centering. Permit heavier loads at higher speeds.

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SPEEDS UP Grinding, Milling, Drilling and Punching Operations

Keeps Tools Sharp Longer. Quickly demagnetizes work held in magnetic chucks, tools, drills, punches, dies, etc. Releases metallic dust and other abrasive particles that cling to cutting edge of tools; thus prolonging sharpness.

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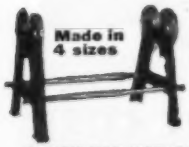
Marks tools, parts and all materials, permanently. Prevents loss, theft, coufusion and resultant delays.

IDEAL METAL ETCHER

Permanently marks on steel, iron and their alloys. Electric. 4 sizes.



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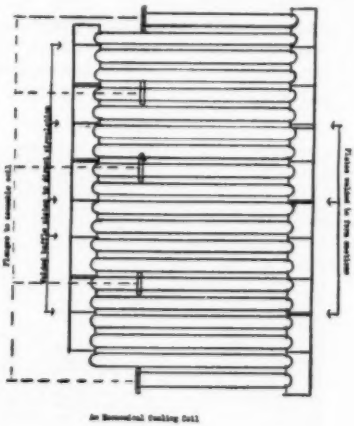

An Economical Cooling Coil

Welded Cooling Coil

A space saving and economical cooling coil can be easily built with standard pipe lengths and arc welder. Due to the necessity of conserving fittings for our war program, Frank E. Thomas,

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A Hevi Duty Muffle Furnace in the Anaconda Laboratory

In the never ending quest for better wire and better cable . . . Anaconda carries on continual research and development in their chemical and metallurgical laboratories. For experimental heat treating in the laboratory, Anaconda uses a Hevi Duty Muffle Furnace.

Send for Bulletin HD-535 — it describes Hevi Duty Muffle Furnaces.

HEVI DUTY ELECTRIC COMPANY

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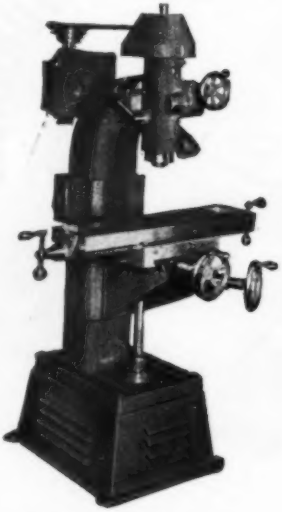
Our Immediate Deliveries Are Helping to Increase

WAR PRODUCTION

In Hundreds of Plants



The Jackson No. 2 Vertical Milling Machine, ruggedly built of quality materials, will prove indispensable for Tool Room or Production applications. 5 speeds, V-belt drive, sturdy 4¼" quill and ¾" spindle capacity, 8"x32" table.

Wire, Phone or Write

Jackson

Machine & Tool Company Sales Division

956 Roberts St. Jackson, Mich.

oil company welder of Wichita, Kansas, suggests this easy method of constructing a cooling coil.

First, two sections of 4" pipe (any desired length) were laid out for the headers. Holes were cut in the headers to insert the circulation 3" pipe. To direct the flow of circulation, baffles of ¼" discs were welded inside the headers through the holes cut for the 3" pipe. ¼" plates were also welded inside the headers to form sections. Note that only four pairs of flanges were used in this 20-pipe circulation coil.

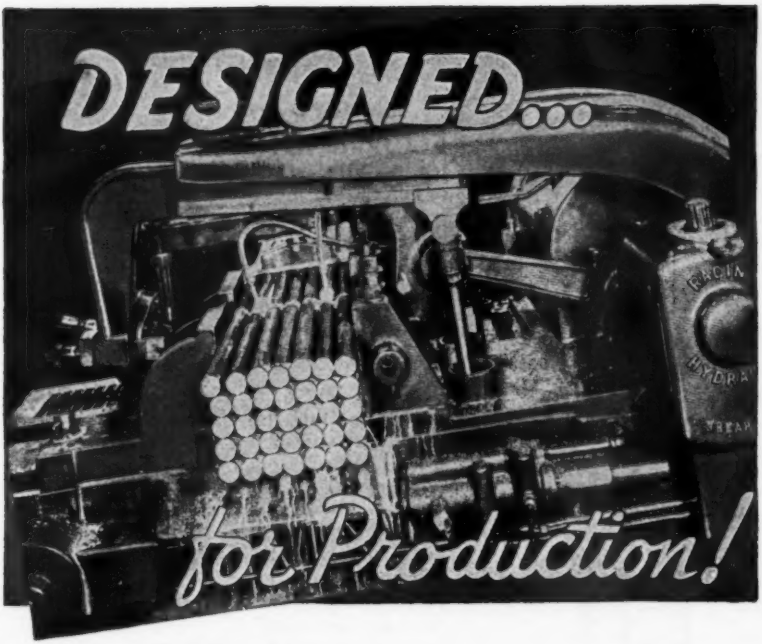
The cost of this coil, as reported in the Hobart Arc Welding News Contest, was less than that of a regular "U" bend coil. This coil fits into a 9-foot space. "U" bend coil would require an 11-foot space. The 3" pipe in the baffle coil can be put in with 5" cl diameter; "U" bend requires 9" cl diameter. Diagram shows simplicity of construction.

(Courtesy Hobart Brothers Co., Troy, Ohio)

Variable-Voltage Improves Wire Drawing

Wire is drawn by pulling it through a succession of dies. With each die is a motor-driven drum, around which the wire is snubbed. Obviously the motors must always maintain the same ratios of speed, from threading at low speed to running at high speed. The motors heretofore have been supplied from a constant-voltage bus, the speeds being controlled by field rheostats positioned mechanically by the wire itself.

The George W. Prentiss Co., Holyoke, Mass., has developed a wire-drawing bench using variable-voltage motors supplied by Westinghouse. Rheostats and mechanical connections are eliminated. Once the proper field adjustments are made to each motor, they can be simultaneously started from standstill, operate at low speeds for threading, and on up to full running speeds—simply by raising the supply voltage. The motors through all this maintain their speed ratios so exactly that tension in the wire is constant on each side of each die. The result is greater mechanical and operating simplicity. Breaks occur less frequently in the wire; starts are smoother.



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are designed for sustained production. Day in and day out **RACINE** Heavy Duty Hydraulic Saws are setting entirely new standards in the cutting of bar stock—structurals—die blocks—in steel mills—shipyards—production plants —wherever metal cutting jobs are tough.

Smooth, oil cushioned operation gives added blade life and maintains unequal production rates. Finger-tip, hydraulic control reduces stock handling time. Compact, rugged construction means longest life.

RACINE largest line—full range of types, sizes, and capacities. **RACINE** Heavy Duty Hydraulic model 10x10 up to 14x20. **RACINE** Shear cut 6x6, 8x9, **RACINE** Hydraulic Oil Cut 6x6, **RACINE** Utility Hydraulic saws wet and dry cut types 6"x6", and **RACINE** Fully Automatic Hydraulic Saws. Performance records upon request.

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In 1930, Mr. R. M. Severance gave his attention to Hand Cut Rotary Files, and especially to the waste in the fact that "hand cut files must be scrapped" without virtue of being resharpened.

This thought and subsequent efforts led to the birth of MIDGET MILLING CUTTERS. "Ground from the Solid after Hardening" makes "Regrinding" possible; and, also, the "four-in-one saving" . . . . ONE, in conserving High Speed Steel—TWO, in faster performance—THREE, in longer operational life—and FOUR, in money saved through "Regrinding", which reclaims most of the Severance Midget Cutters even scores of times.

MANUFACTURERS of Midget Milling Cutters—"Chatterless" Countersinks — Tube Deburring Cutters — and Special Tools.

Although delayed deliveries are still in evidence, Severance continues to think in terms of Engineering Service, and in greater Production and Regrinding facilities, including their completely equipped Western Service Branch located at 3844 S. Santa Fe Ave., Los Angeles, California.

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"REGRINDING SAVES STEEL, TIME, LABOR AND MONEY"

Swivel MILLING MACHINE Vises

Also Mfr's of
Magnetic Chucks
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85 LB. MASTER

HEAVY DUTY
6½" SIZE

$32.55

Suitable for milling machines, drill presses, shapers, etc., these large semi-steel vises may be used plain or swivel. The steel jaws are sturdy. Key slots provide for attachment to machine table holding surface, with jaws at right angle or parallel to table. Junior 4¼" size, 45 pounds, **$23.60**

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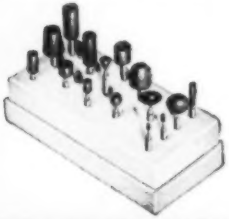
● That's right, and here's how: The Handee line is the most complete ever offered to fit all portable power tools—300 different stock items to add to their usefulness and versatility. Look over the cross section shown here. Consider how this or that one will enable you to do some special job faster and better—how a hundred of them



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A popular selection of 15 of the most practical shapes and sizes.

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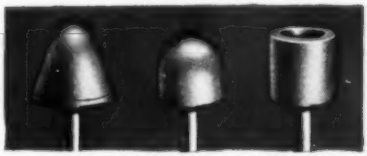

No. A-4 WHEEL Mounted on ¼" mandrel. **75c**

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No. 5900 STEEL CUTTER on ⅛" shank **60c**

No. 5904 STEEL CUTTER on ⅛" shank **85c**

No. 5910 STEEL CUTTER on ⅛" shank **85c**

No. RF-219 STEEL CUTTER on ¼" shank **$2.50**

No. RF-152 STEEL CUTTER on ¼" shank **$2.50**

STEEL CUTTER SET No. 3041

12 selected Cutters mounted on ⅛" steel shanks.

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12 selected Cutters mounted on ¼" steel shanks.

$27.00

No. 27 SAW—¼" diam. .023" thick, ⅛" hole. Saw only, **75c**

No. 20 SAW—¼" diam. .033" thick. Mounted on shank, **75c**

No. 3019 Cutting Disc, of rubber. 1½" diam. $\frac{1}{16}$" thick, ⅛" hole, **40c**

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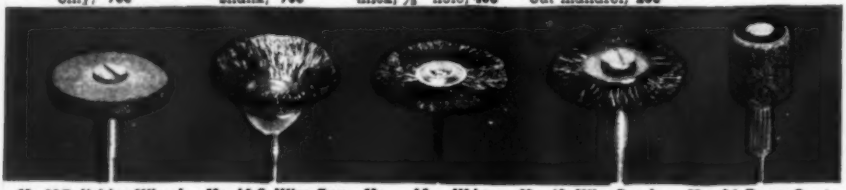
No. 3050 Grinding and Polishing Kit. $2.00



No. 29 Polishing Wheel. Soft rubber. ⅞" diam., ⅛" thick, ⅛" hole. Without mandrel, **20c**

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No. 15 Wire Scratch Brush 1" diam. On $\frac{1}{32}$" diam. shank, **30c**

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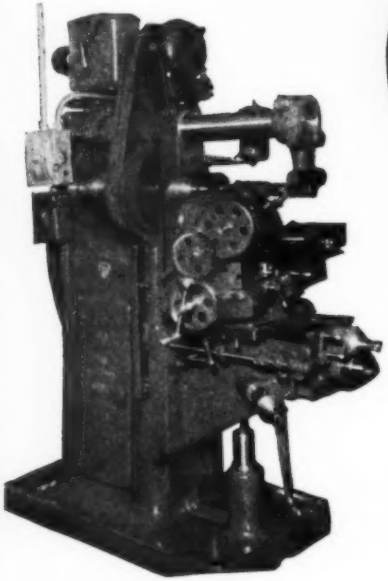

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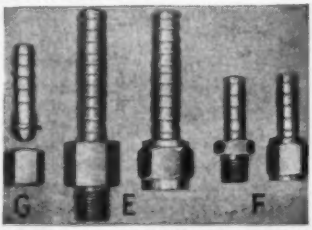

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H.S.S. Tipped Tools

The General Tool & Die Corp., 62 Franklin St., East Orange, N. J. announces two new processes of tipping tools with hardened H. S. S. tips. One process involves brazing a hardened H. S. S. tip to shank steel without changing the hardness of the tip. The second process consists of arc welding a hardened H. S. S. tip to shank steel without cracking or softening the hardened tip.

Obviously, these two processes result in a material saving in the amount of H. S. S. required per tool. As a rule only 5% to 10% of H. S. S. is needed to make a tool as compared to a solid H. S. S. tool. A great many of these tipped H. S. S. tools are produced from scrap pieces of hardened H. S. S., viz., pieces that have become too short to use, broken H. S. S. shanks, etc.

Useful part of dovetail H.S.S. form tool mounted on steel shank.

Sketch A, showing method of mounting H. S. S. tip on steel shank.

One particularly successful application of the process is in the use of stub ends of dovetail H. S. S. form tools that have become too short to hold securely, or form tools that have broken dovetails. In some cases, these dovetails break on initial use of the tool. In such cases, the process permits making tools from such scrap or broken tools, since only half of the length of the solid H. S. S. dovetail form tool can usually be used. The balance must be used for clamping or holding. Sketch A shows how these dovetail form tools are mounted on a steel shank. It is claimed that this process of salvaging results in a tool that often is better than a solid tool because the dovetail never breaks, and that the process provides a resiliency to the tipped tool that the solid tool lacks. These scrap

BRIEF
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10" swing; 24" between centers • Bed 8 15/16" wide by 43 1/8" long • Prismatic V and flat ways, hand scraped and honed • New Departure precision pre-loaded ball bearing headstock spindle • Thread cutting, 4-216 per inch • 25/32" hole through spindle, 1/2" collet capacity • 12 spindle speeds, 30 to 1450 revolutions per minute.

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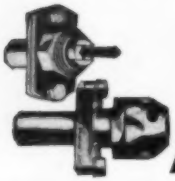
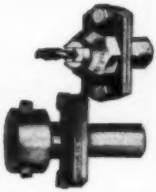


THE ALCO TOOL CO.

835 Housatonic Ave., Bridgeport, Conn.

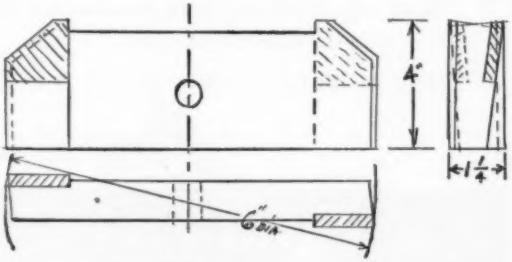
Detroit Office; 908 Stephenson Bldg.

ALCO EFFICIENT TOOLS



pieces of dovetail form tools make useful tools at a substantial saving over solid H. S. S. form tools. Thus, a large number of broken or scrap dovetail H. S. S. form tools for shell work are being quickly restored to service. The company now manufactures all of the dovetail from tool types of H. S. S. tool in this manner, thereby using only from 10% of the H. S. S. formerly required.

Another important aspect of these two new processes is that it has been possible to continue to provide the medium and high cobalt H. S. S. steel to customers who send in medium and high cobalt H. S. S. scrap for tipping. For instance, one firm used a number of solid ¾ x 1-¼ x 8" solid—8% cobalt H. S. S. tools. When these were used to a length of 5", they were too



Sketch B showing method of mounting H. S. S. dovetail form tools.

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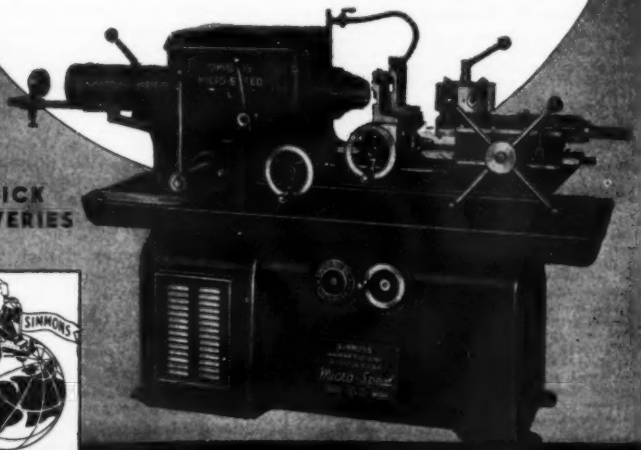
ABOUT SIMMONS NO. 2 TURRET LATHE

We are merely presenting facts when we tell you that the Simmons No.. Turret Lathe (1¼" Bar Capacity) offers high precision at low cost . . . that with the Micro-Speed Drive you can select instantly any of 1,000 spindle speeds by the turn of a handwheel located adjacent to the Selector Dial Control on the new cabinet base . . . that the spindle brake is an important asset for short-cycle operations.

We prefer to turn the job of providing superlatives over to some of the many important firms that have found in this sturdy machine the answer to their No. 2 Turret Lathe problems. Firms such as Bell Aircraft Corporation, Bendix Radio Corporation, Cessna Aircraft Company, Fairchild Aircraft, Ltd., Sterling Engine Company, Swift Lubricator Company, Dominion Engineering Corporation, Ltd., and many others. Ask for copies of their comments when you write today for a Descriptive Bulletin.



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The handiest, versatile little "pinch-hitter" that ever came industry's way. Use it at the bench — suspended from any convenient hook — or slung from the shoulder by slipping a strap through motor hanger. Even if you have heavier types flexible shaft tools, FOREDOM offers the advantage of accurate, sensitive control thru its sturdy pencil-size handpiece, of which thousands are in use. At this low price Model 111 frequently pays for itself on one job—complete with Kit and accessories..... $23.50

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short to use any further. These short H. S. S. shanks are now used to make ¾ x 1-¼ x 8" tipped H. S. S. tools. Each of these 5" long pieces produces 12 tips, ⅜" thick, ¾" wide x 1¼" long, hence producing 12 tipped H. S. S. tools. This customer can no longer buy the high cobalt H. S. S. but still can continue using this type H. H. S. for a long while through use of of their scrap H. S. S.

Delivery of tools has been expedited in many cases through these processes, because of the time required to obtain the larger sections of H. S. S. needed for solid tools.

This company feels that certain types of tipped H. S. S. tools will be popular even after passing of the present shortage of H. S. S. due to the stronger and cheaper tools produced. A notable example is the large fish tail boring tool. These tools, made of solid H. S. S., often broke because of hardening strains while it is asserted that the tipped tools never break. One such fish tail tool used a piece of H. S. S. 1¼" thick, 4" wide and 6" long weighing about 9 pounds. Now two tips, 3/16" thick, ¾" wide and 1" long are used for tipping, weighing a total of about 2 ounces. By tipping, a saving of about 8 pounds, 14 ounces of H. S. S. results and a stronger tool is made. Sketch B shows how this tool is constructed.

Applications have been made for patents covering the process.

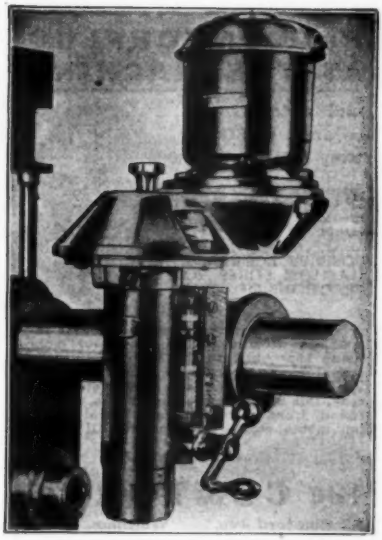
Modern Pipe Vises

By John E. Hyler

The older types of pipe vises nearly always were designed from the double V-jaw standpoint. In other words, two opposed V-jaws were utilized to hold the pipe being cut or threaded, and there was four-point contact on a piece of pipe so held, regardless of its diameter. While such tools were good, and while they are still used to a considerable extent, it is an interesting fact that the chain type tool is fast growing in favor. A chain will drape itself about the upper half of a pipe circumference with a number of contact points, and the greater the diame-

HALCO
Universal Head

Speed-Accuracy-Dependability



The Halco Hi-Speed Universal Milling attachment is designed to meet the demand for greater efficiency, better workmanship, and for speed in building tools, dies, jigs, fixtures, wood and metal patterns, and other machine products where accurate and fast machining are of prime importance.

With its 4 inch vertical travel, many drilling, milling, boring and facing operations can be accomplished in one setup. The total weight is approximately 90 pounds, and it can be easily mounted by one man.

The Halco Head is engineered and built to precision limits in a modern shop by skilled mechanics. All parts and materials built into this machine are the very best obtainable and unconditionally guaranteed for six months.

Motor of heavy duty type, ⅓ H. P., 110 volts, 60 cycle, with plug-in cord and switch. Easily reversible for L. H. cutters. Five speeds 350 to 2900 R. P. M. Also 10 speeds 125 to 2900 R. P. M. available at extra cost.

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With 10 Speed Back Gear
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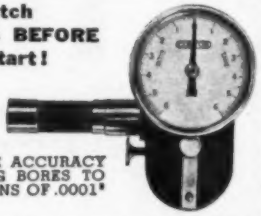

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A favorite with government and private inspectors, Comtorplug is more and more being sent out into the shop to give the operator utmost control of his machine. Usable by green hands with complete accuracy, this unique gage shows size, out-of-round, front or back tapers, barrel-shape, bell mouth, etc., to fractions of .0001".

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The Walton Co.

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ter of the pipe, the greater is the number of contact points, which is entirely reasonable and consistent.

A pipe vise that fails to stand rigid and steady when it is being used, is certainly not one to be desired, yet one quite often found older styles of portable pipe vises with this drawback. Interesting from this standpoint is the introduction of a three-legged pipe vise, stand. Three legs always make perfect support, regardless of how far the floor or the ground where they are standing, may be from level or true.

There is also the type of chain vise that is designed more particularly for shop use, which is attached permanently to a bench top. An adjustment nut beneath the bench top operates by means of a swing lever for tightening the chain on the pipe being held. Some of these vises are fitted with an extra long nut, knurled to make for easy turning with the fingers until it comes up to the contact point. This provides for speed in operation, since only the last turn or so of the nut must be made with the lever.

(Such a 3-legged portable pipe vise stand is made by Armstrong Mfg. Co., Bridgeport, Conn. Chain type bench vises are made by Billings & Spencer, Hartford, Conn.)

Johnson Offers New Furnace

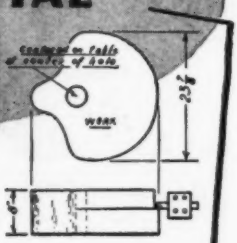
The Johnson Gas Appliance Co., 554 E Ave., N. W., Cedar Rapids, Ia., announces a No. 820 Tempering and Drawing Furnace.

The manufacturer states that the No. 820 speeds the tempering of tools, dies, small parts, non-ferrous castings and parts; and that it can be used for any work requiring a temperature range from 275 to 1200 F.

Designed as a production industrial furnace, the 820 is compact and requires little floor space. It is heavily lined with insulating refractory and equipped with two large Johnson atmospheric burners. The counterbalanced, self-aligning door is constructed to reduce heat loss to a minimum, and is easily controlled by a crank at the operator's left. The firebox size is 16x 16x14" and the furnace is equipped with two Allegheny metal shelves. According to the manufacturer, reasonably prompt deliveries can be made.

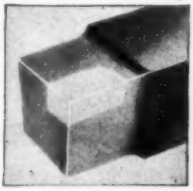
HOW THE GREATER STRENGTH OF KENNAMETAL

PERMITS INCREASED PRODUCTION WITH LOWER TOOL COSTS

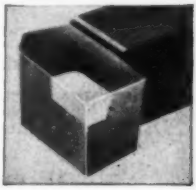


SAE 4140 forging, machined with Style 3 KENNAMETAL tool. Note interrupted cut resulting from the irregular shape of work piece.

KENNAMETAL Grade KM, the grade most commonly used in machining steel up to 550 Brinell hardness, has a transverse rupture strength of 305,000 lbs. per sq. in. Harder grades of KENNAMETAL also have relatively high strength compared to other tool carbides of the same hardness. The higher rupture strength of KENNAMETAL offers the following advantages to users of steel-cutting carbide tools:



- **Takes interrupted cuts, and roughing cuts on scaly surfaces without tool breakage.** Many jobs thought too tough for carbide tools are now machined at high speeds and with long tool life using KENNAMETAL.



- **Can be used at heavier feeds than other carbides.** The greater chip thickness of steel cut with KENNAMETAL means faster stock removed than when lighter feeds must be used.

- **No "sandwich" brazing required.** When brazing KENNAMETAL blanks to tool shanks, the brazing material is allowed to run freely over the surface of the recess, the tool (with blank in place) is heated, the blank is pushed firmly into place, and the tool is allowed to cool. This simplified brazing procedure results in lower tool costs.

KENNAMETAL
The Accepted
STEEL CUTTING CARBIDE

It costs you no more to use KENNAMETAL—the harder, stronger, more crater-resistant steel-cutting carbide tool material. Write for Price List No. 7 containing new low prices effective Jan. 5th, 1942, and for catalog No. 42.

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"Tooling Up" for

IN A lathe intended primarily for use in tool rooms, the ability to operate satisfactorily over a wide range of speeds is essential. In fact, it is not at all unusual for this type of lathe to be called upon to handle jobs which require speeds that run all the way from 5 to 2500 rpm.

In one typical case, machining a ¼" diameter starter pin bearing, a speed of 1200 rpm is required. In another instance, chasing a hob 3½" in diameter, a spindle speed of only 25 to 30 rpm is used. On a third job, one calling for a light cut on a brass rod, a speed of 1800 rpm is desired. And so it goes, from one job to another, and one material to another, each presenting different requirements in the way of the best operating speed or combination of speeds with which to do the work.

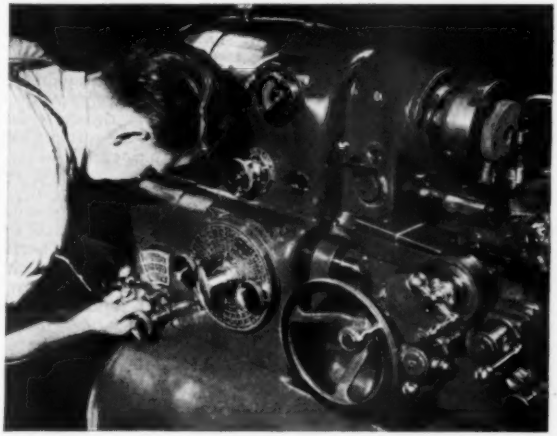


Fig. 1—With the lathe stopped, the operator is throwing in the 6 to 1 ratio back gears. These are used when particularly heavy loads are to be imposed at speeds **under** 400 rpm.

At the outset, the Monarch Machine Tool Co., Sidney, Ohio, experimented with many methods of obtaining the range of speeds desired for its 10" tool room lathe, settling finally on an all-electric, adjustable-speed drive developed by The Reliance Electric & Engineering Co., Cleveland, Ohio.

The new adjustable-speed drive consists of a control unit with start, stop, and reset buttons, a 3-hp d-c motor which is belt-connected to the lathe through a pulley keyed to the spindle, a speed-adjusting rheostat, and a master lever, located directly below the spindle, for starting, stopping, and reversing the lathe motor itself.

Along with a control panel containing forward and reverse contactors controlled from the master lever on the headstock, all of this electrical equipment is concealed inside base.

Spindle speeds (indicated in rpm) are shown by a magnetic type tachometer which has been flush-mounted on front of lathe headstock.

The heart of the adjustable-speed system, the V*S control, comprises a compactly-packaged enclosure of an exciter and generator mounted on the same shaft with an a-c motor that drives them. The exciter provides constant voltage to supply generator and motor fields. Speed adjustment of lathe motor is obtained through what might be called a tandem rheostat, one section of which is connected into the generator field circuit and the other into the field of the lathe motor. This rheostat, mounted inside base of lathe, is manually-controlled by a small knob or hand wheel brought out through front of lathe.

When the generator field coils are connected to one end of the rheostat, they become short-circuited and generator voltage is practically zero, being only that amount produced by residual magnetism in the pole pieces. When the generator field coils are connected to the other end of the same resistance, they are directly across exciter and generator voltage will be at a maximum. Moving speed-adjuster knob farther in the same direction introduces resistance in series with field of lathe motor to give a further control of the effective range of operating speeds to be obtained. This adjusted voltage (which ranges between 35 and 250 volts in actual operation) is applied directly to armature of lathe motor to vary its speed from essentially zero at the lower voltage to 2500 rpm. at the top voltage.

The speed as set by the rheostat is relatively constant and does not change greatly with a change in load. When maximum voltage is applied to armature of motor (at maximum speed) the speed variation from zero to full load is about 10 per cent. The same variation in speed is present at all voltages or speed settings. However, there are few operations on the lathe which would ever vary from approximately zero to full load in their power requirements, so only a part of the speed change proportional to the load change actually takes place in operation.

Over the voltage-control portion of the speed range (residual to maximum voltage), the driving motor develops constant torque. As resistance is added to field coils of the motor, its torque falls off directly with the speed, and constant hp is developed.

A 6 to 1 ratio back gear has been incorporated as an integral part of driving motor, rather than in headstock of lathe, to provide additional power for cutting at lower speeds. Even at top speed, the spindle can be thrown directly from forward into reverse and vice versa. These back gears make it possible to utilize the full 3 hp of lathe motor, not only at the higher spindle speeds, but also from 400 rpm down to 4½ rpm as well. The overall range of spindle speeds is from 4½ to 2500 rpm. Spindle can be driven, of course, either directly by motor or through the back gears which are engaged by a lever located on front of lathe immediately adjacent to speed adjuster knob. However, the change from direct to back gear drive should not be attempted except with spindle stopped.

Operation of the adjustable-speed drive is very simple. The V*S control unit is started up at the beginning of each work period and is only shut down when work is done. "Start" and "stop" station for unit is located to the left and immediately below bed of lathe. A small green pilot remains lighted as long as control unit is running. The "stop" button has been provided with a large "mushroom" head and located low enough on lathe front so operator can hit it with his knee.

Starting of the V*S unit does not, however, start motor which drives lathe spindle. This motor is separately started and stopped in either forward or reverse direction by means of a hand lever. This hand lever must be in the center or "off" position to start the V*S control unit. Its operating speed, as already mentioned, is controlled by a knob protruding through front of lathe from rheostat units mounted inside lathe base. Speed of the spindle may be increased or decreased at will throughout the full range of 2500 rpm while spindle is turning or at rest.

No. 2 *American* Plain Milling Machine

Motor-In-Base Drive

Infinite Spindle Speeds

Standardized Spindle Nose

Heavy Rugged Construction

Centralized Controls

Send for descriptive bulletin

J. L. LUCAS AND SON, INC.

MACHINE TOOLS

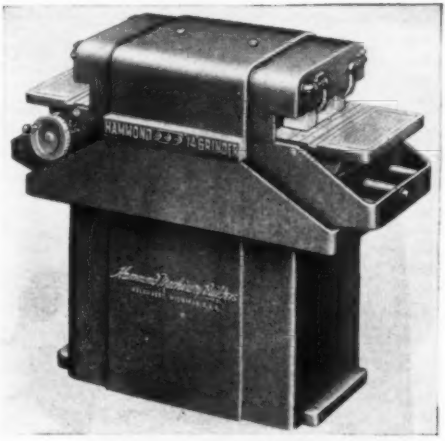
Bridgeport, Conn. **United States, America**

A sustained overload on either driving motor or adjustable-speed control unit will cause spindle to be stopped automatically. Restarting is accomplished by means of a reset button located on rear of lathe head.

Connection to the main a-c power supply is through a simple 3-wire circuit such as would be required for a squirrel-cage motor with across-the-line starter. Secondary circuits between V*S unit, lathe driving motor, and start and stop stations complete the necessary electrical connections.

Hammond "14" Carbide Tool Grinder

A new, faster and more accurate Carbide Tool Grinder is announced by Hammond Machinery Builders, Inc., 1614 Douglas Ave., Kalamazoo, Mich.



It is available for wet or dry grinding and is built in two models—cup wheels both sides or cup wheel one side and straight wheel other side. The tables are mechanically controlled. Angular setting of each table is quickly obtained by a hand wheel graduated to degrees. One revolution of hand wheel equals 30°. The angular range is from 15 to 30° below horizontal. A crank handle moves table in or out from wheel. Uniform distance between operator and wheel face is maintained by coordinated movement of wheel hood and sludge pan with table. Table surface is grooved, facilitating tool movement and to help keep table clean. Steel replaceable wearing strip 1¼" wide is fitted as an insert in table next to wheel. Table is 22" in length by 12" depth. Machine itself is 56" wide, 50" high, and 32" deep.

A new compound protractor tool gauge has been developed for use on table that has superior feature of being entirely universal, it is claimed. It not only slides in table slot parallel with wheel in a regular manner, but it also has a cross slide for sliding toward wheel. Cross slide permits use of protractor when grinding parallel or at a slight angle with tool. Protractor provides angles from 0 to 90°.

A coolant system provides for wet grinding. Coolant pump is powered by ¼ hp motor, supplying coolant to both wheels.

Grinder is powered by a 3 hp reversing motor and is multi-V-belt driven. Spindle speed is 1350 rpm providing wheel speed of 5000 sfm. Spindles are oversize and bearings are protected by positive oil-water and labyrinth seal.

The GLENNY

Adjustable-Expansion

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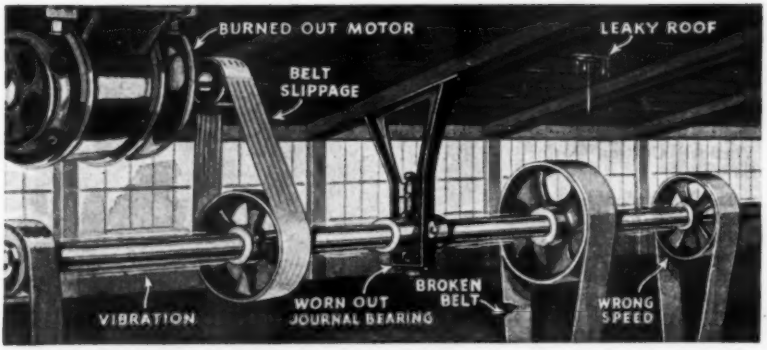
Produces low cost, accurate keyways. Eliminates set-up time. Self aligning. Interchangeable parts. Adapted for arbor press, mechanical or hydraulic pressure. Speeds up production. Cutter bars in carbon or high speed steel. *Details? Write!*

EAST SHORE MACHINE PRODUCTS CO.

833 E. 140th St., Cleveland, O.



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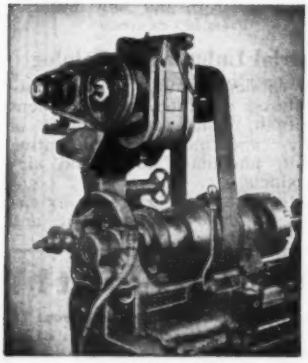

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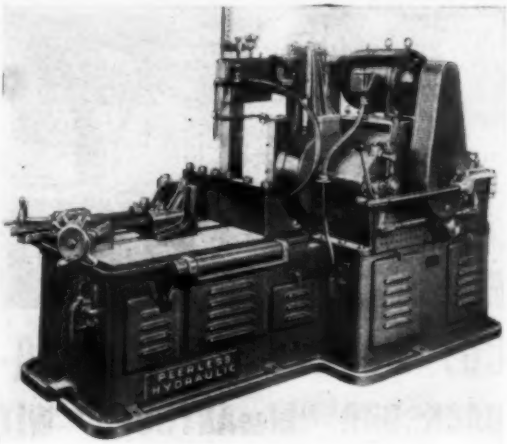
AVOID DELAYS! Increase YOUR production! Order your TORQ-QUA-MATIC Drives NOW! You'll do a better, faster job today and a more profitable job tomorrow.

Sizes 1 to 15 H. P.

THE TORQ ELECTRIC MFG. COMPANY
6605 CARNEGIE AVENUE • CLEVELAND, OHIO

Peerless Vertical-Cutting Power Saw

The Peerless Machine Co., Racine, Wis., announces a new catalog which describes in detail, various improvements in a new model Vertical-Cutting Power Saw.



The extension of the work-table to 35" permits handling of extremely large work which can be lowered to and readily removed from the saw by crane. Huge slabs of Hardtem, tool steel, as long as 24" and any thicknesss up to 10" now can be sawed through without turning the work. Elevating stock rollers are provided on both sides of the work-table to facilitate shifting the work. These elevating rollers as well as the saw-blade feed pressure, and the blade lift are operated hydraulically.

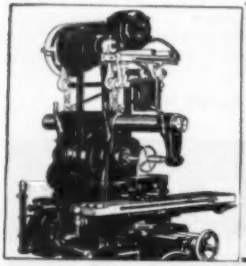
The new Peerless Vertical-Cutting Saw is filling a need vital today in large forge shops where shell forgings and forgings for tanks and planes are being produced in wartime volume. When the hard-worked dies wear dull and chip in triple-shift service a truing cut can be taken quickly on this Vertical-Cutting Saw. In sawing out new die-blocks as little as 1/32" is left for planing down. Thus the maximum size, squarely-cut pieces of costly tool steel are left for making up shearing dies, strippers, and stripper plates.

Other applications, including the cutting of test samples from steel-mill billets, are covered in the new bulletin No. 53.

Industrial Lubricating Catalog

A new catalog of industrial lubricating is offered by The Aro Equipment Corp., Bryan, Ohio, manufacturers of automotive and industrial lubricating equipment, pneumatic tools, and aircraft products.

It illustrates and describes an extensive line of pneumatic, electric and



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To meet war production demands get more work out of your present shaft driven machines. Oust line shafting. Install Remco Motor Drives. Quickly, easily installed—at very low cost. Show production increases up to 100%. Power saving up to 50%. Smaller H. P. motor used. Motor switched instantly in case of "burn-out." No delay. Write! Remco Products Corp., State St. at R. R., York, Pa.

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STOW FLEXIBLE SHAFT MACHINES

The

"ONE BEST TOOL"

for many of your

TOUGHEST JOBS!

On Maintenance Work *as well as on the production line, Stow units save time and money. No long production hold-ups for repairing dies and doing other maintenance jobs. With Stow* **you bring the machine to the work!**

When finishing of irregular-shaped pieces can't be done by machine set-up . . . when casting fins and welding beads must be dressed down . . . when individual fits must be made during final assembly . . . when hard-to-get-at jobs need machining . . . Stow Flexible Shaft Machines will "save the day."

Stow units are true many-purpose machines—equally useful and efficient for grinding, filing, drilling, wire brushing, buffing, sanding and polishing. Changeovers from one operation to another require only a few seconds. And for every job, they provide the **right** tool at the **right** speed!

If you are going to buy flexible shaft machines, remember—Stow has 66 years of experience in flexible shafting—the most extensive in America. Stow units have the perfect combination of ruggedness and handling ease plus ready portability which lead to greater production at less cost. Write **today** for complete catalog.

STOW MANUFACTURING CO., Inc.
30 SHEAR STREET BINGHAMTON, N. Y.

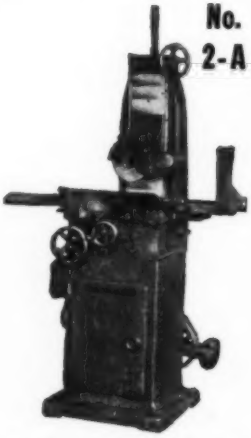
INVENTORS OF THE FLEXIBLE SHAFT

REID

Automatic Feed

SURFACE GRINDER

No. 2-A



The No. 2A Surface Grinder will grind work 18" long, 6" wide and 11½" high, using a wheel 7" in diameter.

High-grade, heat treated Chrome Molybdenum steel spindles, hardened and ground.

Work table 46" long, 8" wide, with a working surface 18" by 6" and 3 T slots; Table travel is automatic in both directions.

Machine requires a 1½ H.P., 1800 R.P.M. motor which is entirely enclosed in base.

Good deliveries if priority is attached to order.

Write to Dept. A for Circular
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Distributors in all Principal Cities

hand operated units, stationary and portable models, to meet the requirements of large and small plants in applying every type of lubricant. Service direct from 100 or 400-lb drums is a convenient feature of many pneumatic models, but air or manually operated hand guns and portable bucket type dispensers provide practical, inexpensive units for specialized requirements such as lubrication of bearings, pumps, gears, gear boxes, etc.

One of the useful features of Aro high pressure power equipment is the ability to deliver either single measured shots of grease (avoiding over filling and lubricant waste), or continuous flow for rapid filling of large cavities. The illustration shows a Model 51-S High Pressure Lubricator being used for lubrication of large Turret Lathe. Drum cover type unit provides service direct from standard 100-lb grease drum, and the two-wheel truck makes it conveniently portable.

The Bryan and Cleveland plants of The Aro Equipment Corporation are operating 7 days per week, 24 hours per day turning out defense products, and tools and equipment for defense plants.

Immediate Delivery

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NEW

NICHOLS

Hand Milling Machines

DESIGNED FOR VOLUME PRODUCTION OF SMALL PARTS AT LOW COST

The NICHOLS Hand Milling Machine is ideal for small part milling. Its rugged design and inbuilt accuracy make it an indispensable modern, high production tool. Its high precision and speedy set-up permits you to take full advantage of high cutting speeds.

May we send you illustrated bulletin.

SPECIFICATIONS

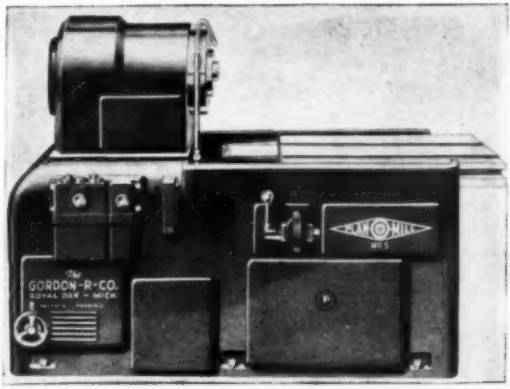
Longitudinal feed, 10". Transverse feed 7". Vertical feeds of knee, 13½". Vertical movement of head, 4½". Micrometer dials on Transverse and Vertical feeds. Spindle speeds 100, 200, 600 and 1200 r. p. m.

W. H. NICHOLS & SONS

WALTHAM — MASS., U. S. A.

Gordon-R Thread and Form-Milling Machine

Combining the recognized advantages of planetary milling with the flexibility of hydraulic operation, the Gordon-R Co., announce a new and larger machine, the Number 5 Hydraulic Plan-O-Mill.



Hydraulic motors on spindle and quills permit operator a choice of feeds and speeds by merely adjusting dials. No gears or sheaves need be changed, the only other adjustment necessary being the lead screw on spindle. The table is also hydraulically operated.

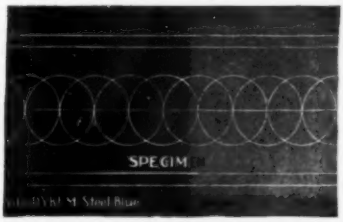
The new machine is asserted to combine extreme flexibility with utmost precision—meeting tolerances to .001" with a minimum of worry and attention. It is especially adapted to thread-milling and form-milling operations requiring a high degree of precision, yet where the type of work may change from time to time.

All motion is in the cutting head. The part itself is rigidly held by its fixture. Large, irregularly shaped parts are accommodated as easily as small ones. Parts ranging from ¾" diameter to 20" diameter, inside and outside, are handled. Because cutter returns to center at end of each operation, a number of successive operations — such as threading followed by concentric counterboring—may be performed in a single work cycle.

O. A. Height is 61½"; Width at floor is 40"; Length at floor, 90"; Height of table, 32"; Working surface:—length 40", width 28". Weight is 10,000 lbs., with fixture (approx).

Maximum capacity is 20" diameter inside and outside. Minimum capacity, ¾" inside diameter. Maximum external diameter without milling head is 3¾". Maximum travel lead screw is 1⅛". Spindle speeds, 40 to 370 rpm. Spindle Motor, 3 hp Vickers hydraulic. Spindle bearing, SKF Precision; spindle taper: No. 50. National Stanard.

Feeds, coarse and fine, manually and electrically controlled. Feed motor, Vickers hydraulic, 140 in. lb. torque, 300 rpm return. Table is hydraulically operated from 2" bore cylinder. Motor: 1-7 hp, 1200 rpm. Electrical system, including motor, is standard equipment. Complete hydraulic system, including Vickers double-acting vane type pump and prefabricated hydraulic tank, included as standard equipment. Coolant pump and tank



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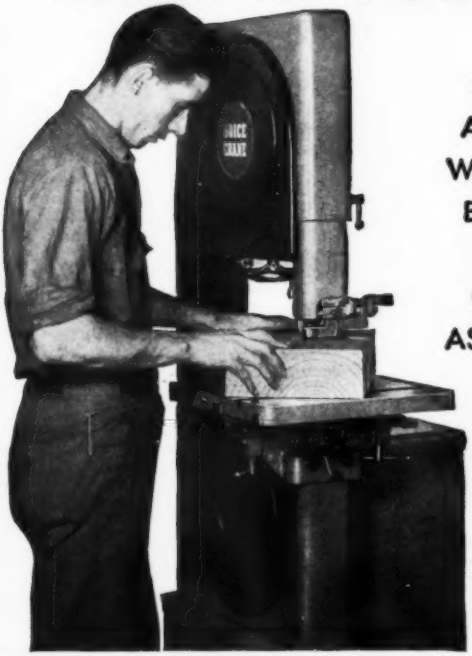

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A newer, safer, more powerful all-purpose 14" band saw. Saves space. Saves time on countless cutting-off operations in foundry and plant. Ideal for all kinds of contour work in large and small die and tool shops.

New—larger capacity under the guide provides 8-5/8" clearance.

New—sealed construction greatly increases operator safety-efficiency.

New—strapping strong welded frame lengthens blade and machine life.

New—powerful, 8-speed ball bearing gear box drive. 90 to 1100 ft.p.m.

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THESE sturdy couplings with their flexible rubberized fabric discs definitely do "Keep 'em Turning" without requiring any lubrication or attention. Creates a flexible joint in shafting that aids in eliminating wear and tear on the driving units.

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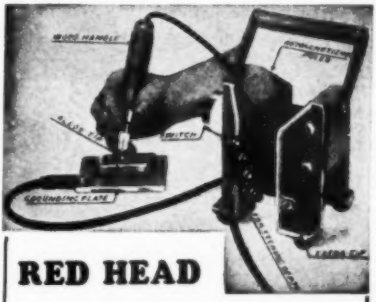
are built into machine. Lubrication is positive, fed by Vickers pump when machine is operating.

Clockwise or counter-clockwise rotation of the cutting head is controlled by a switch of the valve control. Selector switch permits machine to be operated manually when automatic cycle of operation is not desired. Feed cycle ranges from 1½ minutes to 8 minutes per cycle. Rapid return, regardless of time in cut.

Vascoloy-Ramet Catalog

A new catalog and revised price list of Vascoloy-Ramet Tantalum-Tungsten Carbide Tools and Blanks is announced by Vascoloy-Ramet Corp., North Chicago, Ill.

It lists 22 typical styles of Vascoloy-Ramet single point tools, together with a grade selector chart recommending the grade of Ramet Carbide for practically every cutting condition in steels, cast iron and abrasive materials. Included are instructions for ordering tools and blanks, also tables for computing costs of standard tools and blanks and special blanks at the recently reduced prices.



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AIR HOSE COUPLING

The call today is for speed and more speed to keep 'em flying and rollin' and that's why you will find Hansen *Push-Tite* air hose couplings right in the thick of the war production fight, being used extensively by the Army, Navy, aviation and industrial plants throughout the country.

Hansen Push-Tite air hose couplings are rugged, fast, economical, easy to operate and trouble proof. A slight push of the plug into socket . . . it's connected absolutely air-tight and the air is automatically turned on, a gentle pull . . . it's disconnected and air is instantly turned off. None of the customary twisting or turning of parts in order to connect or disconnect and the coupling's complete swiveling action prevents kinking or twisting of hose.

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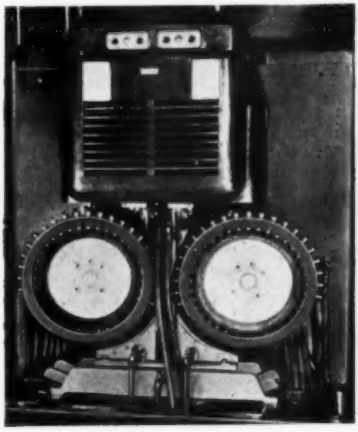
Products Engineering Company announce they have available in stock for immediate delivery, a complete line of A.S.A. Standard Drill Bushings. These bushings are precision ground and are A.S.A. Rockwell 60-65.

Order your needs now or send for illustrated catalogue giving factual information on the complete PECO line including Quick-Acting Jig Clamps, PECO Speedrivers, PECO FLUSH Rivet Sets and the PECO Low Cost Jig Accessory Line. Products Engineering Company, 700 E. Florence Avenue, Los Angeles, California. ADVT.

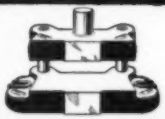
Hardening Tappets by Induction Heating

Using 3000 cycle induction heating, a single automatic machine in a large automobile plant is reported to be hardening tappets at the rate of 70,000 a day—more than 100 a minute. Out of 28 million hardened, there have been no rejects due to improper heating.

The tappet is made of cast iron as in the past, but a steel insert hardened by induction heating and quenching is now brazed to the top of the tappet cylinder. The new design is said to



BAUMBACH



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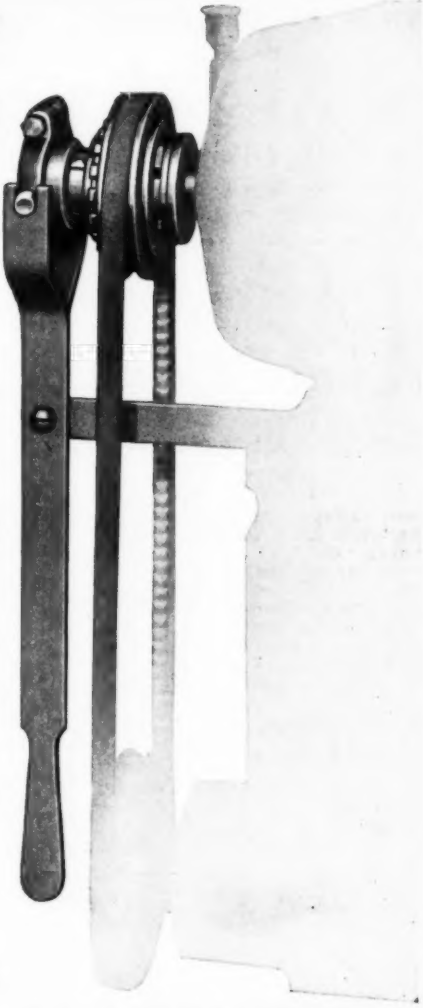

Full floating plates . . . high ratio leverage, easy engagement, instant release, drag free idling.

Entire unit can be mounted in a jiffy.

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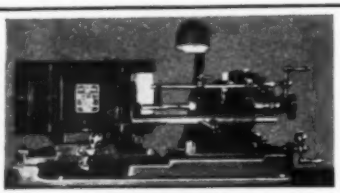
SCREW MACHINE SET-UPS
COMPLETE
FOR
BROWN & SHARPE AUTOMATICS
George L. Detterbeck Co.
Formerly Banner Mfg. Co.
1671 Clybourn Ave. Chicago, Ill.

have shortened and stiffened the push rod considerably, contributing to smooth, silent motor operation and increasing the life of the tappets and rods. Previously it had never been practical to harden the tappet end sufficiently in this new design.

The tappet ends are brazed to the cast iron cylinders in a brazing furnace by melting a copper wire around the joint. Brazing at the rate of 4000 units per hour is made possible by the conveyor system. The unhardened pieces are then inserted in holes in the rim of a rotating wheel that revolves slowly through a high frequency field supplied by a Westinghouse 180-kva, 3000-cycle generator. Here the seat and shoulder of the tappet ends are heated to 1500 F and quenched in about three seconds, but the heat is so localized that the other end of the tappet remains at room temperature. The heating process is continuous; each piece is quenched as it drops by gravity into the quenching tank below and is carried away on a conveyor. About 70,000 units per day are hardened to 55 Rockwell C by the one machine.



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Taps sharpened on the **J-B** stay sharp longer.

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Useful for finishing propellers in aircraft construction. Descriptive bulletin and sample wheel will be sent on request. Prompt Deliveries.

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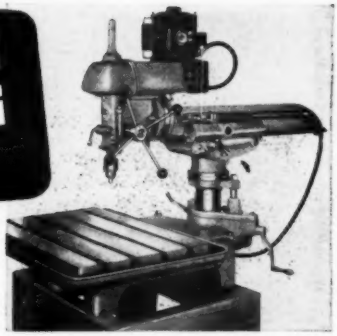
WALKER-TURNER MACHINE TOOLS

Solve a "hundred and one" War Production Problems!



Giant battleships, huge bombers and heavy field guns get the headlines . . . but equally important are the thousands of small parts, accessories and countless lighter products that go into our vast War production. Here, Walker-Turner Machine Tools are proving "lifesavers" for aircraft, munitions, shipbuilding, electrical, tool-making and other war production plants . . . relieving large, costly machines for heavier work . easing machine tool shortages . . . performing every kind of operation on metals, wood and plastics.

Walker-Turner Machine Tools are carefully engineered for speedy, accurate production -- ruggedly constructed to stand up under 24-hour, 7-day week schedules. Volume production assures prompt delivery. Write today for the catalog of Walker-Turner Machine Tools and discover how many of these versatile machines fit immediately into your production set-up. Walker-Turner Co., Inc., 1732 Berckman St., Plainfield, N. J.

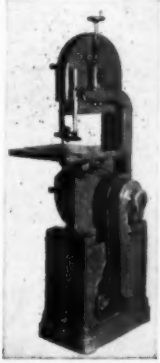
RADIAL DRILL. Handles many light drilling, routing, tapping and profiling operations as effectively as larger machines costing 5 to 6 times as much. Drills to center of 62" circle. Head tilts 45° left or right. Maximum distance nose of chuck to table, 13½" Spindle traverse 3¾"

METAL CUTTING BAND SAWS. 14" and 16" models. Back gearing and cone pulley provide speed range from 61 to 5300 s.f.m. for cutting practically any material from tool steel to wood.

20" DRILL PRESS with smooth, positive Power Feed, operated by clutch and powered from drill press spindle. Drills to center of 20" circle. Holes from 1/16" to 1". Speeds 280 to 5200 r.p.m.

METAL CUTTING RADIAL SAW. Cuts, saws, trims, grooves, profiles, shapes and miters metals, wood and plastics. Handles many sizes and shapes, including large flat pieces. Geared motor gets shaft closer to work, permits smaller wheels with greater rim force and increased cutting capacity.

SPINDLE SHAPER for wood, aluminum, non-ferrous metals, plastics. Geared motor operates spindles at 7600 r.p.m. Has reversing switches, many useful accessories, other features.



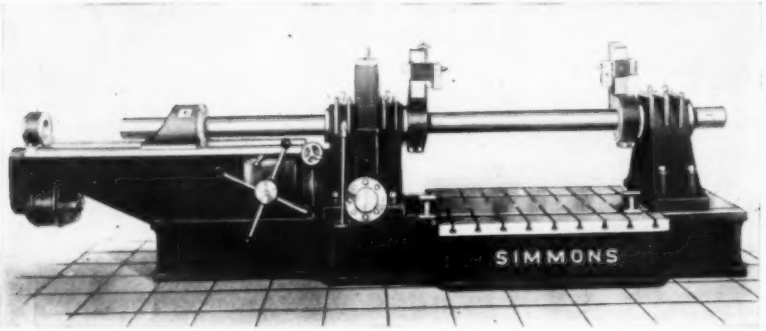
walker-Turner COMPANY INC PLAINFIELD N.J. U.S.A.

WALKER-TURNER MACHINE TOOLS

FOR METAL, WOOD AND PLASTICS

DRILL PRESSES · BAND SAWS · BENCH SAWS · TILTING ARBOR SAWS · LATHES
JIG SAWS · RADIAL SAWS · RADIAL DRILLS · BELT AND DISC SURFACERS · JOINTERS
SPINDLE SHAPERS · GRINDERS · FLEXIBLE SHAFT MACHINES · CUSTOM BUILT MOTORS

Simmons Horizontal Boring Machine



A 6" Bar Horizontal Boring Machine has been developed by Simmons Machine Tool Corp., 1725 N. Broadway, Albany, N. Y.

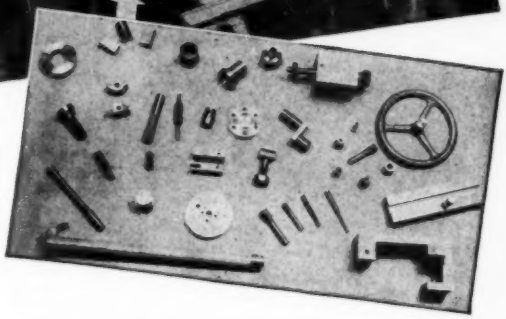
The bed is of massive box type construction, heavily ribbed and braced. On standard machines it is 188" long with a widened portion 51½" wide, 68" long, 18" high, and provided with horizontal and cross Tee slots.

Height from top of bed to center line of boring bar is 24". When ma-

Long-life spring tension heat-treated into Sutton Feeders and the surer grip of Sutton diamond-serrated Collets protect screw machine production and make machines live longer . . . Ask for complete Sutton Catalog.

SUTTON TOOL COMPANY
2895 W. Grand Blvd., Detroit, Michigan
Accessories for Screw Machines

How Atlas SERVES THE NATION



Meeting SCREW MACHINE Needs

★

QUICKER DELIVERIES NOW On Preference Rating Certificates

These pictures from the Inland Manufacturing Company in Buffalo, N. Y. show how Atlas equipment is helping in vital war production. Inland makes parts for Bell Aircraft and also for gun mount adapters. Tailstock and carriage turrets of the Atlas lathes greatly increase production on many operations such as turning, centering, counterboring, end milling, grooving, threading and drilling.

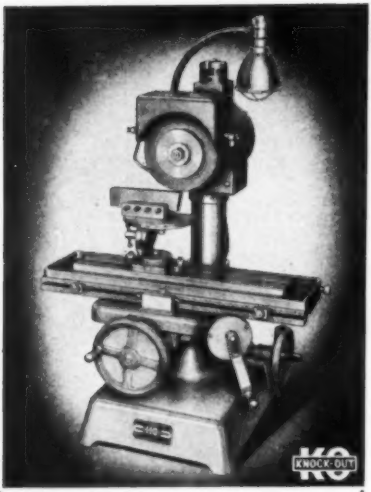
New production machinery and the determination of Atlas workers to help avenge Pearl Harbor have increased production the past few weeks. Quicker deliveries are now possible on preference rating certificates.

Atlas — ATLAS PRESS CO. KALAMAZOO, MICH. U.S.A.

ATLAS PRESS COMPANY

350 N. PITCHER STREET, KALAMAZOO, MICHIGAN

LATHES • DRILL PRESSES • ARBOR PRESSES • SHAPERS • MILLING MACHINES



The Model A603 Chip Breaker Grinder is another Knock-Out to add to a long line of fine machine tools. Its 11-inch longitudinal table movement makes it ideal for manufacturing operations. The addition of a tilting table attachment makes it capable of the complete maintenance of carbide-tipped tools.

Write today for CBG42 and PL42-3H

K. O. LEE COMPANY
Aberdeen, South Dakota

chine is furnished without center section of bed, the height from floor line to center of bar is 42".

The headstock houses worm gearing comprise the main drive to boring bar, all gears running in an oil bath. Head and tailstock provide double bearing to the drive quills. Tailstock is adjustable on the bed from 0" to full 60".

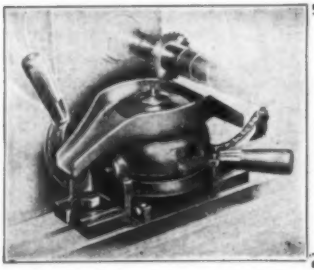
Extension is also of the same box type construction and provided with accurately machined double ways for carriage feed head and support of the boring bar in withdrawn position. The Micro-Feed mechanism is housed in this extension.

Boring bar is of turned and ground high carbon steel, thoroughly normalized with Brinnell hardness of approximately 220. It is 6" in diameter and the standard length is 17'. Longer lengths may be provided.

Feeds are obtained through the Micro-Feed unit, an infinitely variable transmission built integral with the extension, giving both fine and coarse feeds ranging from .004" to 1.000" per revolution of spindle.

Travel of bar is 60" in one setting. Power rapid traverse of boring bar in either direction is accomplished through a separate motor with convenient control. This same drive is used for keyseating and light planing.

Main drive to boring bar is operated through a 6 speed gear box with chrome-steel nickel gears mounted on multiple spline shafts with anti-friction bearings running in oil. It is arranged to receive 15 hp motor mounted on gear box with provision for V-belt or silent chain drive.



Mill Over 1,000 Parts Per Hour

WITH THE

NEW Dearborn Automatic Chucking and Indexing Fixture

Work held by draw in collets. Collets open and close automatically. Work automatically ejected. Indexes without loss of time for milling 1, 2, 3, 4, 6, 8, 12 or 24 sided pieces. Minimum set-up time required. Speeds up production. Positive and accurate in operation.

J. W. DEARBORN
72 S. CLIFF ST. ANSONIA, CONN.

Bar speeds with 400 to 1600 rpm variable speed motor are 1 to 16 rpm. With 1200 rpm constant speed motor, 3 to 12 rpm.

Capacity between facing heads is 60" on the machine with standard 17' bar. Bar lengths up to 24' can be furnished. This necessitates bed extension in like manner. With 24' bar length the distance between facing heads is 144" and the widened portion of bed is 152" long. Facing capacity is from 9" to 38½" diameters.

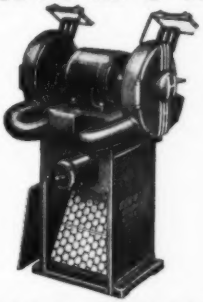
Diameter of boring bar is 6"; End Taper Hole, Morse No. 6. Travel of bar, one setting is 60"; Standard length of bar 17'; Extra bar lengths up to 24' are available. Length of bed is 188".

Widened portion of bed on 17' Bar Machine is 51½"x68"x18" high; on 24' Bar Machine 51½"x152"x18" high. Number of T-slots cross is 9; Number of T-slot longitudinal, 2. Net weight 16,000 lbs.

Equipment includes motor base and drive (not including electrical equipment), two (2) facing heads, operating handles and wrenches.

PLASTICS ON AN ELECTRIC refrigerator are shown on this chart. An estimated 20 per cent increase over 1941 in the number of plastic parts is attributed not only to metal scarcities but to plastics' insulating value, economy, durability, and rust and moisture resistance, which adapt them particularly to electric refrigerators. (Courtesy—E. I. du Pont de Nemours & Co., Inc.)

New HAMMOND



"NO-DUST" GRINDER

SAVES MORE THAN ½ FLOOR SPACE

Hammond's streamlined, functionally designed "NO-DUST" GRINDER UNIT requires only 6½ sq. ft. of space, where average grinder with independent dust collector requires almost 15 sq. ft. of today's valuable floor space. Hammond's "NO-DUST" Grinder is available for 10" 12" or 14" wheels . . . has greater mobility . . . sets up anywhere near electrical outlets ready for work.

WRITE FOR BULLETIN GP-13

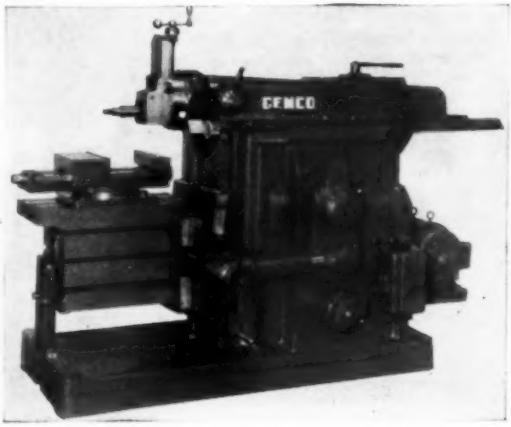
Hammond Machinery Builders INC.

1614 DOUGLAS AVE., KALAMAZOO, MICH.

Eastern Branch, 71 W. 23rd St., New York City

Gemco Multi-Purpose Shapers

A new development in the construction of Crank Shapers is announced by General Engineering & Mfg. Co., 1524 S. 10th St., St. Louis, Mo., who for many years have made Kelly Shapers. The new machines are known as Gemco Multi-Purpose Shapers and are characterized as production machine tools of a high order.



The new design features include: — 1. Independent power rapid traverse to table; 2. Universal table; 3. Built-in circulating force feed lubricating system; 4. Spray lubrication of all internal parts; 5. Self-cleaning, automatic oil filter; 6. "Lubrigard" which permits operation of Shaper only when sufficient lubricating oil is sup-

GAP GAGE GRINDER...

Precision-built for precision work. The table, ground to extremely close limits, is longitudinally controlled by a feed screw with dial graduated to .0001". Wheel spindle, mounted on preloaded bearings in ground housings, is balanced to eliminate vibration. Smooth, easy lateral movement by pinion and rack on cross slide. Simplicity of operation assures highest grade work in minimum time.

REDUCE GRINDING COSTS ON YOUR GAP AND SNAP GAGES

An ordinary mechanic can learn to do first class work efficiently with only a few hours training. Machine can also be used for other types of grinding work.

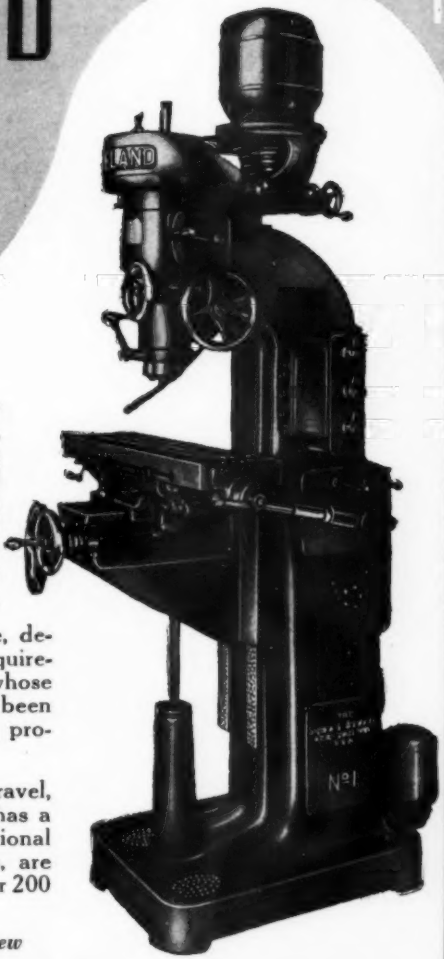
Write for our new circular describing this machine in further detail and giving complete specifications.

NY-LINT TOOL AND MFG. CO.

NY-LINT TOOL & MANUFACTURING CO.
1823 16th AVE., ROCKFORD, ILL.

The CLEVELAND

NO. 1-VERTICAL MILLING MACHINE



Designed to meet the steadily growing demand. This small, rigid, high-speed vertical spindle Milling Machine embodies all essential features required by the modern tool room, die and mold shop, and production plants. The new CLEVELAND is also adaptable to heavy duty continuous production.

It is a completely new machine, designed and built with all these requirements in mind, by a company whose principle business for 20 years has been creating special machines for high production industries.

Longitudinal feed is 18"; cross travel, 8½", vertical travel, 16". The table has a working surface 8" by 32". Two optional ranges of 12 spindle speeds each, are offered, from 100 to 1750 r. p. m. or 200 to 3475 r. p. m.

For further information write for new bulletin No. H. B.

THE SOMMER AND ADAMS CO.

CLEVELAND, O.

New!

DUPLEX "M" Combination Band and Disc Grinder

Improved and streamlined—heavily built for increased production and lower finishing costs.

Motor Driven Ballbearing throughout—Fully enclosed adjustable drive. Large disc grinding table.

Write for illustrated folder for this and other size grinders.

WALLS SALES CORP.
96 WARREN ST. • NEW YORK, N. Y.

plied; 7. Special high power vises with graduated base; 8. Powerful ram with extra large sliding surfaces and bearings; 9. Duplex gear ram drive; 10. Silent gear drive; 11. Wide range of table feed dials for feel stroke and speed adjustments; 12. Centralization of controls for ease of operation; 13. Automatic locking means of stroke and feed mechanisms; 14. Timken roller bearings throughout; 15. Hardened alloy steel gears and shafts; 16. Simplicity of design and streamlined appearance.

Shapers are available in various sizes ranging from 16" to 24" stroke and are offered in three types:—Plain, Production, and Universal. The wide range in sizes and types provides a suitable machine for almost every purpose.

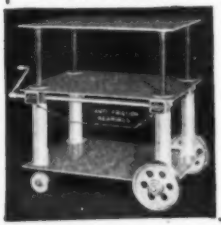
Mastercraft Turret Tool Post

Said to be completely redesigned, streamlined, lightened in weight for faster action and to include many new and exclusive features, an improved Mastercraft turret tool post is announced by F. & M. Sales Co., Hollywood, Cal.

Precision manufacturing methods, it is stated, render all parts completely interchangeable, thus permitting the user to set aside the tool block with all tools remaining in place for future use, while another tool block is being used on the same post. Many difficult tool set-ups may thus be preserved for subsequent runs.

Claimed to be much faster acting, hardened throughout, and self-compensating for wear in hard service, the new 4-Way Indexing Turret Tool Post has been designed especially for use

YOU'LL FIND A THOUSAND USES FOR



THE HAMILTON PORTABLE ELEVATING TABLE

"PORTELVATOR"

frees men for other work. Acts as a lift, work bench or support or level on overhanging units. 1 to 20 ton, hand or power.

Get details . . . write.

STYLE A

THE HAMILTON TOOL CO.
Ninth and Hanover Streets.
HAMILTON OHIO

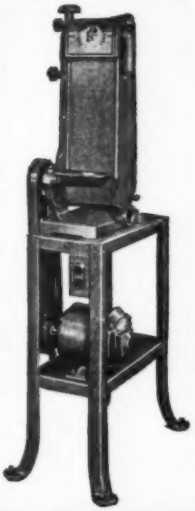
Made for PRODUCTION —— by PRODUCTION

No. 608 Abrasive Belt Surfacer

It saves time burring, surfacing and polishing plastic moulded products, rubber, wood, pressed steel parts, die castings, iron, steel, etc.

Adjustable from vertical to horizontal position within a few seconds. Ball bearing equipped throughout.

Work or belt table is 15"x6". Abrasive belt is 50" long x 6" wide. Work gauge is adjustable to any angle and removable. Other sizes 4" to 20" width of belt. Vertical and Horizontal. Also Reed High Speed Sensitive Drills and Greenfield Universal Tool and Cutter Grinders.



PRODUCTION MACHINE CO.
GREENFIELD, MASSACHUSETTS

SIMPLIFIED INTERNAL GRINDING
the with MAJESTIC INTERNAL GRINDER

An exceptionally wide range of internal grinding jobs can be handled on the New Majestic Internal Grinder. Its simplicity of design and ease of operation are features of utmost importance in providing maximum grinding output at low cost.

SPECIFICATIONS

Length of table, 48". Swing over table, 10". Travel of cross slide, 2½". Precision dial graduated to .0001". Precision bearing work head. Speeds—100, 225, 350 r.p.m.

Write for complete details contained in New Bulletin

Majestic Tool & Mfg. Co.
2948 E. Woodbridge Detroit, Mich.

on 10" South Bend, 9" Workshop and similar lathes, as well as for small screw machines. Socket screws have been substituted in place of standard

set screws. Finish is in durable gunmetal, while the handle is chromium plated and provided with swiveling ball. Four precision steel balls are employed in the block to insure accurate indexing in all four positions.

Skilsaw Offers New Catalog

An attractive new 48-page catalog, No. 43 shows Skilsaw production, construction and maintenance tools "for Defense of America."

All of the various models of electric portable saws, drills, belt and disc sanders, grinders, blowers, suction cleaners and general accessories and attachments are introduced. Sectional and detail illustrations show intimate views of mechanical design and construction. Many illustrations are given of typical jobs showing the machines in actual use. Address Skilsaw, Inc., 5035 Elston Ave., Chicago, Ill.

Eye Aid for Defense Industry

One of the more recent aids to the defense worker is the new Magni-Focuser Eye-Shade. It is equipped with a pair of stereoscopic 5 power magnifying lenses, with which by a slight tilt of the head, the subject is

DIAMONDS for Defense

• Three grades of diamonds. Common quality $12 per karat. Medium quality $24 per karat. Select quality $48 per karat. (Contour template diamonds supplied only in Medium and Select quality.)

All diamond sizes ¼ to 10 karat are nib mounted for immediate shipment . . . Billed subject to approval. Specify quality of diamond wanted. We recommend a minimum size of one karat for each 6" diameter of grinding wheel. (24 hour resetting service, $1.00 post paid.) Grinders instruction card free.

DIAMOND TOOL COMPANY, Not Inc.
935 E. 41st Street CHICAGO, ILL.

NIELSEN
Heavy Duty
Live
Centers

Write for catalog on live centers

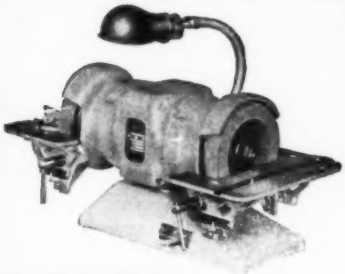
Adapted for heavy duty work. Precision type ball and roller bearings assure maximum capacity for high speed production and long service.

NIELSEN, INC. LAWTON, MICH.

PRIORITY IN EXPERIENCE

Special nails, rivets, screws and other cold-forged products made quickly and economically to your order. Facilities include those for swaging, fluting, knurling, milling, pointing, slotting, tapping and finishing. Send for catalog—no obligation. It will acquaint you with the possibilities of our inexpensive and better method. When you order from Hassall you benefit by ninety-two years of experience, embracing three previous national emergencies.

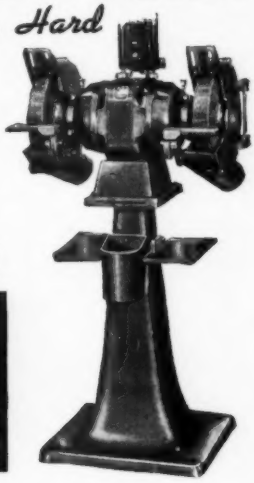
John Hassall, Inc., Clay and Oakland Sts., Brooklyn, N. Y.



STURDY BUILT

for Long, Hard Service

BALDOR builds a complete line of Bench and Pedestal type grinders — 6" to 12" wheels. (At left, is special Carbide Tool Grinder, 6" wheels, complete for $95.00).



ASK FOR BULLETINS

BALDOR ELECTRIC COMPANY
4368 Duncan Ave., St. Louis, Mo.

BALDOR
BALL BEARING GRINDERS

Longer life for CARBIDE TIPPED TOOLS

with this wet or dry

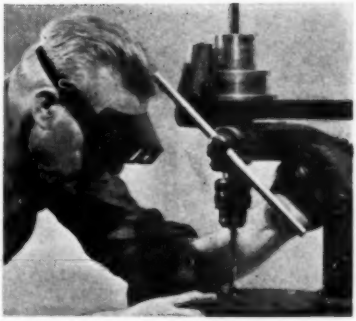
STANDARD GRINDER

This substantial precision grinder provides great economy by removing less metal from carbide tipped tools and gives keener edge in less time.

While each wheel is equipped with wet grinding attachment, a separate toggle switch operates motor driven pump permitting dry grinding. Drum reversing switch included. Manufactured in three sizes: 1 HP for 10" wheels; 2 HP 12", both with 1750 RPM motor; 3 HP 14" with 1150 RPM motor. These grinders use either cup or steel back cylindrical wheels.

Write for Catalog 43.

The STANDARD ELECTRICAL TOOL Co.
CINCINNATI • OHIO
WEST EIGHTH ST.



brought into focus greatly magnified. The wearer when not using the lenses can readily look beneath the shade with his normal vision. It also affords the use of both hands instead of using one hand as with the old fashioned magnifying glass, which never did give the third dimension.

The eye-shade is strong, being made of plastic. It affords protection to eyes from flying particles.

It is made by Edroy Products, 480 Lexington Ave., New York City.

"Handbook for Drillers"

The 22nd or "national defense" edition of "Handbook for Drillers" is offered by the Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, O.

This handbook is written for the student of drills and drilling. It is not intended as a complete treatise on the subject, but rather as an introduction to the theory underlaying the use of the twist drill. It is believed to be the only work of its kind on twist drills and is distributed by the thousands among colleges, technical and vocational schools, manufacturers' apprentice schools, etc.

Subjects discussed and clearly illustrated in this handbook are:—the parts of a twist drill, points on grinding drills, drill speeds and feeds, common errors and their results. A number of tables of drilling data are included and the booklet is indexed.

Silver

Do you know that silver reflects more light than any other metal?

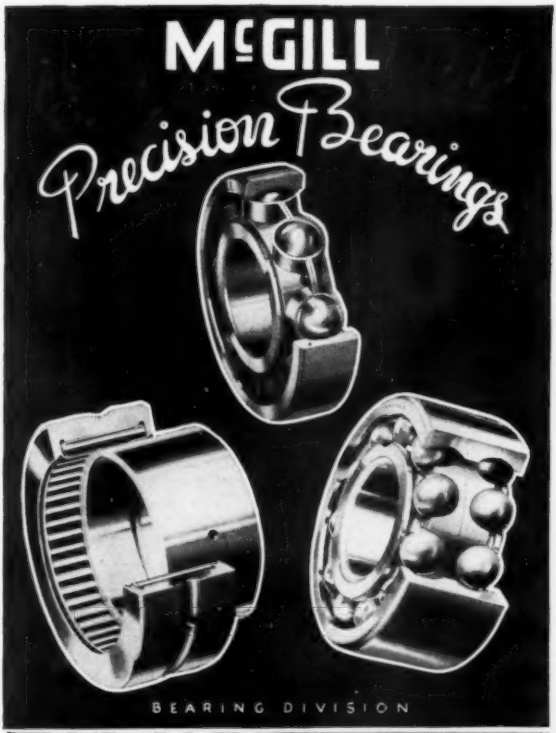
A recent report by the American Optical Society shows that silver reflects 95% of the light which strikes a mirror at an angle of 45°, while aluminum comes next with 88%. Gold rates third with 82% reflection.

Illuminating engineers are reporting the new use of silver for coating the reflecting surface of large lamp bulbs used in defense plants. These bulbs, like sealed-in auto headlamps, are blown from glass and half the interior is silvered to act as a reflecting surface.

The silvered surface remains bright throughout the life of the bulb, and cost of the silver coatings is trifling, since it is extremely thin. In addition, bulbs of this type require no separate metal reflector, and thus save its cost, besides conserving steel for other uses. Since the reflecting surface is sealed inside the bulb, it cannot become impaired and requires no cleaning, resulting in further economies.

Silver has unjustly suffered because it is regarded as a "precious" metal. Many engineers hardly stop to think twice in specifying alloys which contain tungsten, molybdenum, beryllium, or sintered carbides, all of which cost MORE per pound than silver. Yet many hesitate to use silver or silver alloys coating much less, even though knowing the merits of silver.

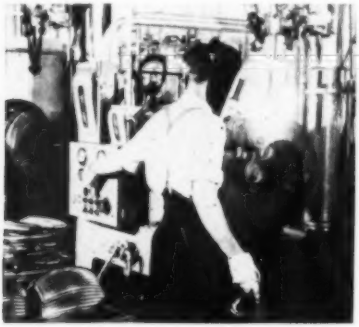
Despite this, industrial uses of silver are gaining rapidly in brazing alloys, for reflectors, silver contacts, etc., and will continue to expand as engineers and others learn to forget that it is "precious" and put silver to use in everyday jobs for which it is ideally suited.



McGILL MANUFACTURING CO.
1700 North Lafayette Street
VALPARAISO, INDIANA

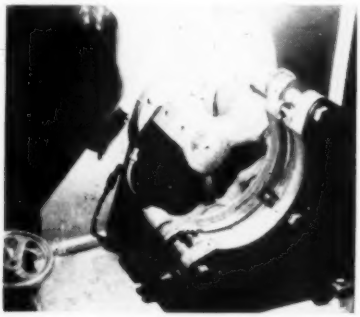
Welding Bren Gun Magazines

Production of Bren gun magazines in a Canadian munitions plant has been substantially speeded since the recent



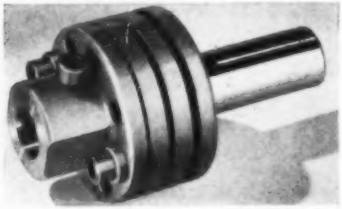
installation of two General Electric atomic hydrogen welding machines. These machines were custom-built for the precision welding of these vital parts by G-E engineers, working with engineers of the munitions plant.

In the original factory at Brno, Czechoslovakia, this task was done by



hand welders, working at benches. British manufacturers developed an automatic method, however, by which the outside seams of five magazines

The EHRICH —— ALIGNING HOLDER



The Ehrich Aligning Holder is universally adjustable with angular adjustment in all planes and with concentricity adjustment independent of the angular adjustment. Used as a tool holder on turret lathes and screw machines, it aligns positively and accurately with the spindle reamers, taps, drills, piloted boring bars, etc. Its many applications as a work and tool holder include holding arbors on lathes, grinders, gear hobbers, etc.; holding reamers or other tools for grinding without centers, or any application requiring precision of adjustment.

MADE BY THE

SOUTH BEND SCREW PRODUCTS

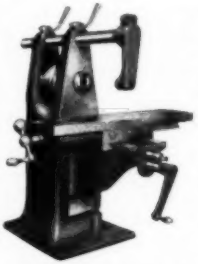
318 E. COLFAX AVE., SOUTH BEND, IND.

Lewis Semi-Finished

BENCH MILL

A PRECISION MILL AT A SENSIBLE PRICE !

Ideal for many uses. All major machining operations finished to high degree of accuracy. Perfectly designed, shop-tested, trouble-proof construction. Exceptionally efficient. Stands severest service. Handles full range milling work. Table 3⅞"x18", travel 12", cross feed 5½", vertical 7". No. 3 Morse Taper in spindle. ¾" center hole adaptable for collet attachment. Complete — including materials, blueprints and **LEWIS COUNTERSHAFT** castings.



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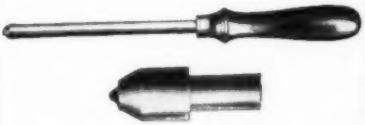

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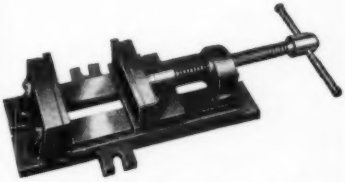

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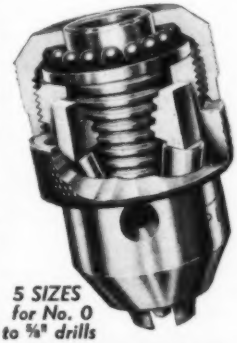
These *Ettco-Emrick* KEYLESS DRILL CHUCKS

will speed up your drilling!



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By eliminating the key, these chucks save a lot of wasted time and energy. Jaws are tightened by drilling action—and the heavier the load the tighter they hold. Yet a twist of the knurled body **by hand** easily releases the grip. As for quality and dependability there are no better chucks made. Use them also in portable drills.

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were welded at one time after all five magazines were clamped in a fixture. Magazines were then placed in another fixture for welding of inside seams individually.

The G-E machines permit welding of both sides of the magazines in one fixture at one operation, effecting an important saving in time.

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PRICE WITH ONE PUNCH AND ONE DIE—
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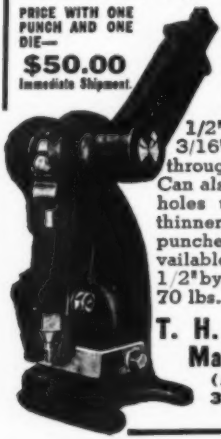

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Tag and Label Addresser

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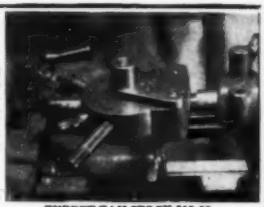

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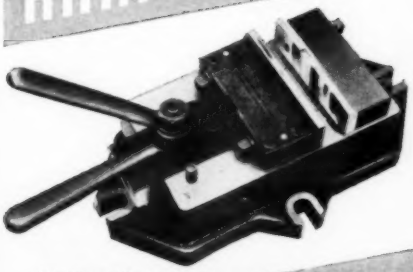

The Vise with the one piece solid forged Movable Jaw

POWER

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This time tested "Four-Point" Milling Vise has performed most successfully for a number of years in large manufacturing plants producing interchangeable parts. It is designed and constructed to take the present day feeds and speeds of modern milling machines... It is particularly adaptable to small arms milling. Production milling work today cannot afford the time and cost of a slow operating vise. Speed is essential, in fact vital. *Write for further and more detailed description.*

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Spot Welders
More Production
Lower Cost!

Features include: transformer which guarantees faster heat, stronger welds; water cooled electrodes and tips; automatic trip switch; adjustable arms; swivel pedal; and heat regulator.

If you have any production problems — *consult us.*

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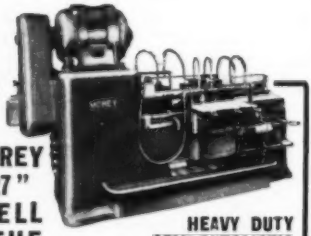

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Since nearly 500 of these links are required per complete assembly depending upon overall length of track, an increase in the output of complete units using tracks of this type calls for greatly increased productive capacity, unless the production method can be improved and time per piece materially decreased.

As shown in Figure 1, flats on sides of the holes are broached. The holes must be accurately spaced to maintain

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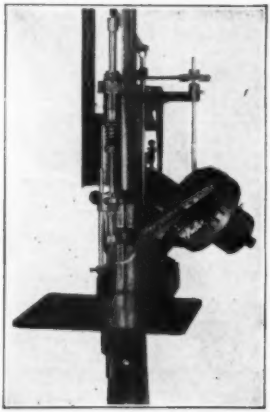

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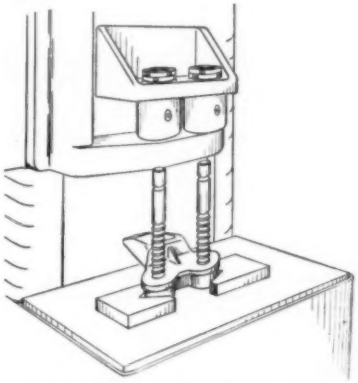
the desired overall length of assembled track. Finishing holes to close limits is also essential to proper fit of link pins. Formerly holes were drilled and reamed and flats were milled. By surface broaching both flats simultaneously, production time was further reduced. Similarly, adoption of broaching for finishing holes saved valuable equipment and time for other purposes. Fig. 1 shows part after surface broaching and prior to finish broaching the holes.



After the holes are drilled to 1-1/16" in diameter they are broached in a Colonial VMS Pull-Down Broaching Machine using fixture shown in Figure 2. Both holes are finished broached simultaneously in each link in a single pass. Finish dimension is 1⅛". The pieces are placed in a simple V-block locating fixture, which positions them

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Dia.	Face	Price	Dia.	Face	Price
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2½	"x2½"	1.45	4½	"x5½"	3.95
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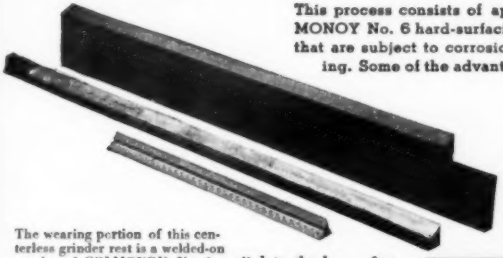

The wearing portion of this centerless grinder rest is a welded-on overlay of COLMONOY No. 6, applied to the base, after which it is machined. On machine tool parts subject to great wear and abrasion such as lathe points, dogs, chip breakers, drill flutes, wire straightening shoes, thrust bearings, screw machine fingers, grinder feed fingers, forming and drawing edges, etc., COLMONOY No. 6 is effecting substantial savings due to its long life, ease of application, wear resistance and freedom from galling.

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This process consists of applying a casting of COLMONOY No. 6 hard-surfacing alloy to steel base parts that are subject to corrosion, abrasion, wear and galling. Some of the advantages of this process are:

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The features that interest you most:

1. Simplicity, sturdiness, and heavy duty.
2. 50% more radial load carrying capacity than the average live center.
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both endwise and sidewise and aids in obtaining the accurate hole spacing desired. Each machine and fixture as shown is capable of broaching up to 110 pieces per hour. The pieces are alloy steel forgings designed to withstand severe abrasion and to provide high tensile strength and resistance to bending in service. A companion piece is a simple link with two holes, which couples each track link with the next. Lips on the links serve to keep assembled track in position on driving sprockets of track-laying unit.

This type of machining procedure lends itself to the use of even higher production equipment. As a matter of fact, equipment has already been designed to raise production to 200 pieces per machine. For this a four broach set-up which will broach two pieces simultaneously is used.

Electric Strain Gage Bulletin

An eight-page booklet (GEA-3673) recently issued by General Electric Co., Schenectady, N. Y., describes electric gages available for measuring mechanical strains. In an interesting and easily understandable manner, this well-illustrated booklet describes the different types of gages available, and discusses their operation.

Stating that the field of application for strain-gage equipment is almost unlimited, the descriptive bulletin goes on to list a few examples of types of stress investigations that can be made. Included among these are the determination of stresses on bridges, tanks, and structural parts; stresses in the rails of railroad tracks; housings of rolling mills; locomotive running gear; beams of shovels and cranes; aircraft structures while in flight; ship hulls and structures; frames of trucks and automobiles. Also for indicating peak stress in connecting rods of large punch presses and press brakes; for indicating the maximum permissible load on the rolls of roll-bending machinery; and for determination of stresses in gun carriages caused by gun recoil.

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Prices range from $57.00 to $253.00. Sizes ¼ HP to 2 HP motors.

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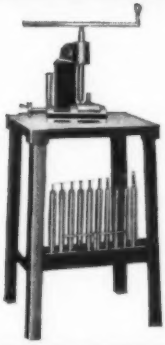

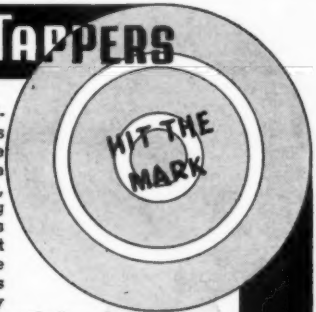

It cuts direct hand-tapping labor costs 75% in Tool and Die Rooms and Machine Shops. Makes quick, accurate tapping easy. Assures holes tapped at right angles without the aid of a square. Does away almost entirely with tap breakage, spoiled work and consequent delays. Ready instantly for any hand tapping job from No. 5 to ¾" tap.

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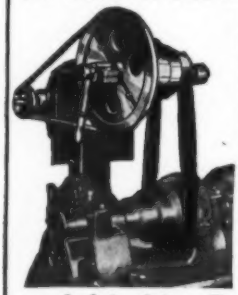

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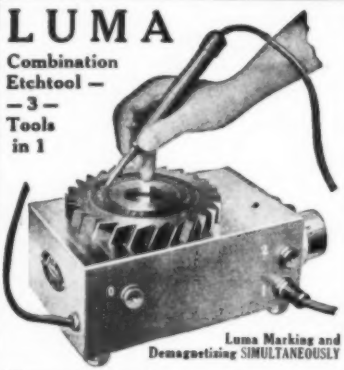

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machines which permit milling to close limits even with unskilled labor. These machines are also designed for versatility; they are adaptable to climb mill-

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Machine Tool Coolant Pumps?

Made in four types: 1/30 and 1/10 h. p. for small machine tools and machines requiring from 4 to 10 G. P. M.

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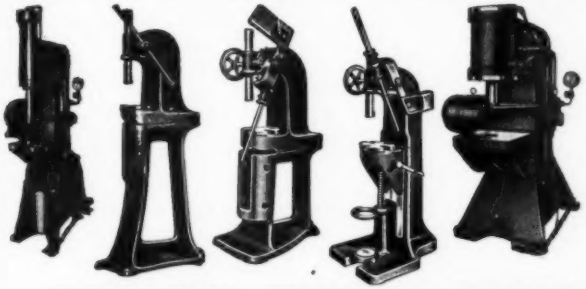

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Quick Acting
Deep Reach
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SCRAPED ANGLE PLATES

SIZE (Inches)	WEIGHT (Ap. in Lbs.)
4 x 4 x 6	12
6 x 6 x 8	30
8 x 8 x 8	55
8 x 9 x 16	75
10 x 10 x 10	80
12 x 12 x 12	120
18 x 18 x 18	222

LOMBARD Angle Plates are made of high grade quality, close grained semi steel type iron. They are hand scraped slowly and carefully to produce a high degree of precision; are excellent for use in strapping work on milling and drilling machine tables. The construction is extra rigid and heavy, built to withstand exceptionally hard usage. Prompt deliveries. Write for details.

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ASHLAND CORP. MASS.

ing, milling to depth, rotary and index milling, step milling, spur gear cutting, automatic cutting-off, etc. In addition, they may be used as standard hand millers.

Multi-Millers were developed primarily for quantity production of small, intricate parts but are also reported to be profitable for the milling of such parts in small lots. This is made possible by their quick set-up feature. A handle permits operator to go through the cam actuated cycle by hand, thus making easy accurate location of the work.

The table feed is controlled by a hardened cam operating against a sector. Standard cams provide fast approach, cut at desired speed, and fast return to loading position. Practically any special cycle desired can be obtained by use of an appropriate cam.

Drive from motor to spindle is direct by means of double V-belts and pulleys. Feed changes are effected by means of a shift lever on the gear change box.

U. S. Multi-Millers are offered in four models of practically the same size, typified by the specifications of the MM-1-6 which follow:—

Working surface of table is 6"x21½"; longitudinal table feed is 6" (with positive table return 5"); distance centerline of spindle to table surface may be varied from 2¼" to 9-3/16"; diameter of spindle is 2"; maximum distance spindle to arbor yoke is 7½"; 12 feed changes are available for each cam; lubrication system is automatic; floor space required is 36¾"x35⅛"; domestic shipping weight 1750 lb.

GOOD NEWS!
for DIE MAKERS
Transfer Points Eliminate Guesswork in Die Making

There's no chance for error when you use transfer screws as markers in setting dies. Points are of uniform height above hex base. Six accurately made and hardened screws nest in a special holder with hex wrench tip. Made in ¼" to 1" diameters.

3/16"	$1.50 per set	5/16"	$1.25 per set	7/16"	$1.40 per set
1/4"	1.20 " "	3/8"	1.35 " "	1/2"	1.50 " "

HEIMANN MFG. CO., URBANA, OHIO

Blackouts

A new type of blackout in which camouflage, lights, and fluorescent chemicals all will play an important part in protecting vital seaboard cities was discussed recently by S. G. Hibben, Westinghouse wartime lighting expert.

He described the 8 months of research which has been conducted on the problem of blacking out strategic objectives within a city rather than a whole city. Ultraviolet light, fluorescent and phosphorescent chemicals promise to provide new tools for safety in blackouts.

Hydrants, curbs, sidewalks, bomb shelters, cars, and clothing can be marked with these chemical paints which glow brilliantly when irradiated by invisible ultraviolet light. Blackout signs in England are now lighted by this method to point the way to shelters, hospitals, police, fire stations.

Other handy blackout aids have been developed. A dim traffic signal light for policemen can be made to glow in different colors, and is valuable in giving various signals. A special glass for factories is made which screens light from the view of enemy airmen at the angle from which bombs are dropped.

By use of camouflage lights, engineers are able to build decoy airfields and other military objects in deserted areas. The illusion of an important bridge span is easily created by stringing rows of lights across a river in some isolated section. A well-lighted empty meadow several miles from a city could typify an airfield if other parts of the city were not completely darkened.

Military experts expect American coastal cities may be subjected to small but powerful token "hit and run" air raids. We hope to prevent these from crippling important industrial targets.

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UNIVERSAL
TOOL & CUTTER GRINDER
FOR ALL KINDS OF TOOLS

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150 BROADWAY, NEW YORK, N. Y., Dept. 805

"CHAMPION"
Steel Racks

Save time, steps and money by keeping bar stock, shafting and pipe out of the way and off the floor.

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The Western Tool & Mfg. Co.
Springfield, Ohio

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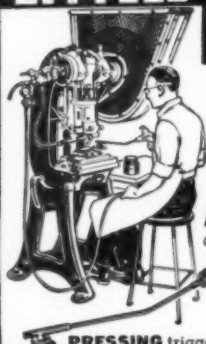


KEEPS HANDS OUT OF DANGER ZONE

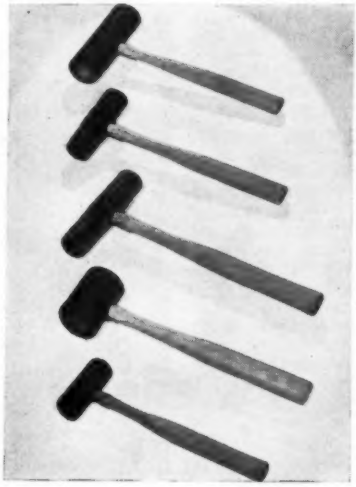
PRESSING trigger creates strong vacuum in cup for holding flat-surface materials for feeding to press. Releasing trigger releases piece held. Keeps hands out of danger zone. Single and double-cup types.

ASK FOR BULLETIN 9-C.

F. J. LITTELL MACHINE CO.
4153 RAVENSWOOD AVE. CHICAGO ILL.

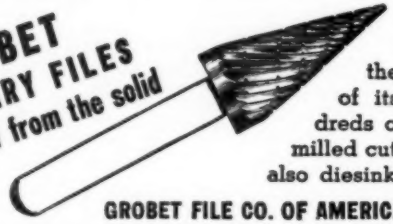
"Densewood" Mallets

By a new patented process, it is asserted that any kind of wood can now be converted into a substance combining high compressive strength and high tensile strength, as well as long wearing qualities. For many uses it is



One of the most popular present uses of this new process is in making mallets or soft-face hammers used in metal shops, machine and tool shops and in a wide variety of industrial plants. Mallets of Densewood are said to be strong enough to take the wrinkles out of heavy sheet metal without scratch-

GROBET
ROTARY FILES
ground from the solid



Ask for Catalog WG

the most complete catalog of its kind, illustrating hundreds of rotary files hand cut, milled cut, ground from the solid; also diesinkers' burs.

GROBET FILE CO. OF AMERICA 3 Park Pl., New York, N. Y.

ing a polished surface or stretching metal. A Densewood Mallet is stated to be tough enough to flatten a ¾" pipe until the pipe breaks at the edges —yet the Densewood head will not split or fray even under this force. Other uses are in the manufacture of pulleys, bearings, rollers, bowling pins, driving pins, etc.

Several Densewood Mallets are shown. A "Lock Wedge" method is used to secure the handle in position "for life." This method, used with ordinary wood, would quickly split the head, due to the extreme pressure used. Further details on Densewood and its many uses may be obtained from the Densewood Corp., Elkhorn, Wis.

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Let Us Do Your Special Gage Work

We have every facility — adequate precision equipment and expert workers—for the quick and efficient production of all types of Gages, Special Tools, Dies, Jigs and Fixtures, large or small. We have complete heat treating equipment and can handle jig boring jobs on our 18"x36" Pratt & Whitney jig borer. Have been delivering satisfaction since 1929.

Address all inquiries to Ray W. Rice, Manager.

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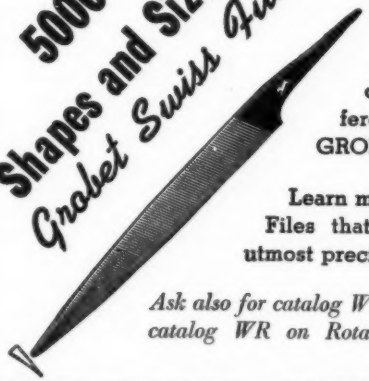
5000 Shapes and Sizes Grobet Swiss Files



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Learn more about these chrome Steel Files that have won a reputation for utmost precision and durability.

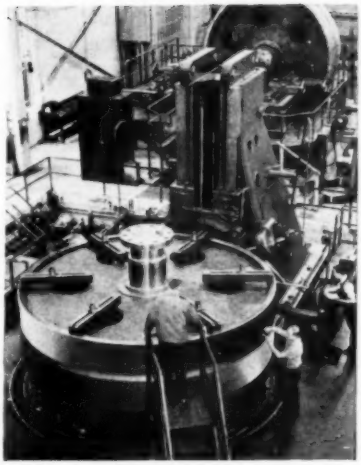
Ask also for catalog WM on Files for Filing Machines; catalog WR on Rotary Files and Diesinkers' Burs.

GROBET FILE CO. of AMERICA • 3 PARK PLACE NEW YORK CITY

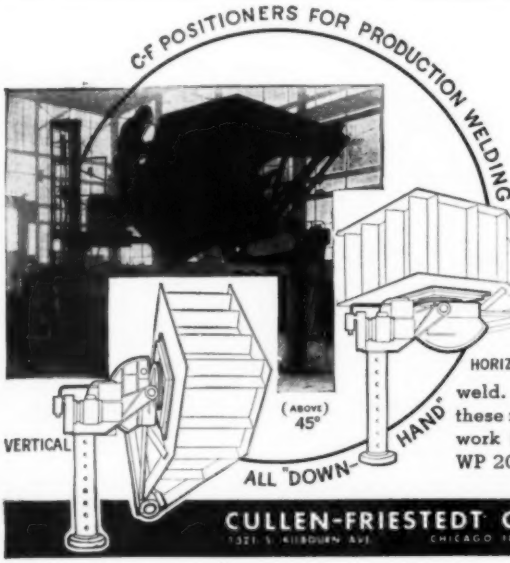
200" Gear Hobbers

By subcontracting most of the foundry and machine work, G-E is halving the 18 months' time previously needed to build a 200" diameter hobbing machine to cut low-speed gears for cargo ship propulsion sets.

Production of major parts for the machine is by 12 separate subcontractors in 5 states, and miscellaneous parts manufacture is parcelled out to 38 firms in 7 states. Two foundries, one in Va., the other in W. Va., cast the major parts. One of these foundries, plus a Navy Yard, a Pennsylvania construction company, a shipbuilder, and a machine tool builder take care of the annealing. Rough machining is handled by one Navy Yard, a steel mill, and a locomotive manufacturer. Two Navy Yards, a third foundry, a second shipbuilder, a manufacturer of safes, the steel mill, and the locomotive firm do the finish machining.



Such extensive subcontracting for production of a hobbing machine is especially remarkable in view of the ultimate precision with which the machine must operate. Finish cuts in bull gears are held to a tolerance of 0.0003".



A fabrication of this size and shape requires many, many passes by the welder. On a C-F Positioner, such an assembly is a very simple welding job because the work may be tilted from horizontal to 135° beyond horizontal, or any angle, and turned in a complete circle to permit "downhand", gravity fed fillets at every weld. The way to find out about these modern machines and their work is to write for our circular WP 20, gladly sent on request.

CULLEN-FRIESTEDT CO.,
1321 S. KILBOURN AVE. CHICAGO ILLINOIS

KNURLED GRIP PREVENTS FINGER SLIP

UNBRAKO

KNURLED SOCKET HEAD CAP SCREWS

Reg. U. S. Pat. Off.

Greasy fingers gear right to the "Unbrako" Knurled head . . . there's none of the slip that occurs with a smooth, oily head.

KNURLING insures production speed-up . . . permits quick, easy locking of the screw after countersinking.

The KNURLING of Socket Screws originated with "Unbrako" years ago.

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"Unbrako"

STANDARD PRESSED STEEL CO.

JENKINTOWN, PENNA. BOX 606

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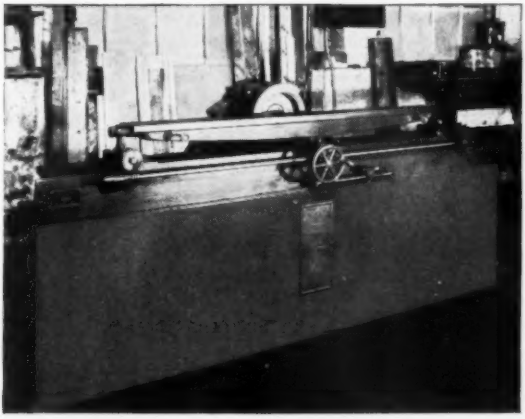
with this PRECISION Knife Grinder

TYPE B26 — 60

Grinds knives edge up or down; flat or concave bevel. Heavy box-type bed provides **stabilized rigidity.** 5 sizes; 26" to 60". Other types for all lengths of knives, — straight or circular. Write for circular on B26-60.



★

SAMUEL C. ROGERS & COMPANY

207 Dutton Ave.

Buffalo, N. Y.

Proper alignment of the machine to do this microscopically close work depends on careful checking and inspecting of subcontracted work in progress.

Total weight of one of these hobbing machines is more than 275 tons. The 2 side bases together weigh 77 tons; the center bed 37 tons; the two stanchions a total of 60 tons; and the table 32 tons. Special well cars are used for transporting the heavy pieces from their scattered production points.

Checking Spiral Gear Leads

Designed to check right and left spiral gear leads from zero to infinity, a new "Sine-Line" lead checking machine, Model 1205, is announced by Michigan Tool Co., 7171 E. McNichols Road, Detroit. Of the adjustable sine-bar type, the new machine eliminates need of master rolls, discs or lead screws in checking gears and can be used with the Michigan gear checking recorder if desired. Gear size capacity of standard machine is zero to 18" diameter, with distance between centers of 24". Bed lengths of 36 and 48" are available at extra cost.

Machine is of horizontal type, designed for maximum rigidity. Operating mechanism, including sine-bar is completely enclosed. All adjustments are at convenient working height, including setting the sine-bar.

Machine consists primarily of two "tables," a traverse table enclosed in left end of machine, which carries the sine-bar and a longitudinal indicator table. Sine-bar table is arranged to reciprocate crosswise of machine, while longitudinal table moves lengthwise paralleling face of gear to be checked. Sine-bar table when moved back and forth rotates spindle on which gear is mounted for checking. When sine-bar is set parallel to axis of machine, gears of infinite lead (equivalent to straight spur gears) can be checked, since longitudinal movement of indicator table

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FREE SAMPLE TAMMS BLUE LAYOUT DOPE

Speeds layout time on brass, aluminum, copper, tin, stainless steel. Won't chip, crack, or flake off. Comes in handy 8 oz. bench type brush-in cans. Also pts., qts., gals., drums.

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ATLANTIC Band Saws for CONTOUR CUTTING

Packaged in Special Box. Permits easy withdrawal to length desired. 100' lengths.

You can simplify CONTOUR CUTTING by using Atlantic narrow sized blades with one temper only. They are best for cutting any and all metals and are used on all makes of band saw machines.

Send for New ATLANTIC BOOKLET covering our entire line.

ATLANTIC BAND SAWS

Used Coast to Coast

ATLANTIC SAW MFG. CO., INC.
153 BREWERY ST., NEW HAVEN, CONN.
"Metal Band Saw Specialists"

HEAVY-DUTY COMBINATION WET AND DRY GRINDER

Model 10 WG

3-HP . . . . 12x2" wheel
For continuous production work. Ball bearing.

HOOD ON WET SIDE has splash bowl with reservoir, settling chamber, centrifugal pump, valve and adjustable nozzle. Pump on rear driven by V-belt. Bearings are not under water.

DRY WHEEL GUARD adjustable to wheel wear with door for replacement, exhaust connection and adjustable eye shield.

Get Catalog No. 56

THE UNITED STATES ELECTRICAL TOOL CO.
THE GOOD MECHANIC'S CHOICE
CINCINNATI, OHIO, U.S.A.

produces no movement of transverse sine-bar table. For any angular position of sine-bar movement of one table produces corresponding movement of other and of spindle according to a simple formula which takes into consideration characteristics and dimensions of the gear, as well as the desired lead to be checked. "Friction rolls" provide two ratios of spindle to sine-bar table. Selection of proper set of rolls is made by moving a lever under cover enclosing sine-bar table. The two ratios provide for all diameters and lengths of gears within operating range of machine.

Correct setting of the sine-bar is established either by use of micrometers or gage blocks placed between end of bar and special 1" diameter locating pins mounted in transverse table. The micrometer dimension or gage block length is also readily established by simple formula. Once set in position, no resetting is necessary so long as gears of same diameter and lead are being checked. The sine-bar is fully exposed for setting by swinging open cover.

Complete flexibility is also provided for checking either face of each gear tooth and at any depth, whether right or left hand spiral. The simple design and arrangement of indicator pedestal makes it easier to swing it into contact, saving time when checking several or all teeth of a gear. One face of a tooth may be checked with indicator in the position shown in Fig. 2, and the other face by swinging indicator to a position 180° from this position. For indexing to another tooth, level on headstock is moved toward operator. This releases spindle allowing gear to turn freely. When next tooth is brought into position, lever is returned to its former position, locking gear.

Movement of indicator along face of gear is accomplished by two controls on front of machine. Lever to the left of handwheel determines whether sine-bar or indicator table is the driving member, depending upon angle of lead. Handwheel reciprocates either or both tables according to the desired sine-bar setting.

All spindles are mounted on preloaded bearings, including tailstock spindle

GEAR AND BELT GUARDS

FOR INCREASED PROTECTION IN YOUR SHOP

Gear and Belt Guards of all descriptions Built to Order to your specifications for all types and makes of machine tools. We will be glad to send full particulars.

PROMPT DELIVERIES.

PENN TOOL & MACHINE COMPANY

100 PENNSYLVANIA AVE. CORRY, PENNSYLVANIA

War Conversion

The conversion of American industry to war production is going ahead rapidly, and many are the changes being made.

Quality Hardware is reported to have cut its output of scooters so as to turn out anti-aircraft gun parts; an envelope folding company now builds parts for 20 mm. guns; manufacturers of coin machines are now fabricating ammunition boxes; Skilsaw now makes airplane and bombsight parts in addition to portable tools; makers of kitchen utensils are now concentrating on cartridges cases; fountain pen makers now turn out screw machine parts for guns; automatic typewriter folks are making pistols and parts; safe builders are busy on miscellaneous small firearms; from piston rings to pistols and revolvers is the transformation in another plant.

Normally more than half of the business of Borg-Warner Co. comes from automobile parts sales. Some time ago they fortunately anticipated the conversion of the auto industry for the duration, and now 80% of their business is said to be for the government, with a $90,000,000 backlog of orders.

They contribute to all military transportation services, using trucks, tanks, airplanes, and marine equipment; some signifcant new products are about to be added to their list, it is said.

Blackout Bulb

Designed for blackout lighting in air raids, the new Wabash Blackout 25 watt bulb just announced by Wabash Appliance Corp., 335 Carroll St., Brooklyn, N. Y. provides for downlighting in a soft beam of blue light that is safe for indoor visibility during blackouts.

The bulb is lined inside with a pure silver reflector lining that hides all filament glare and projects light downward.

New

A POWER FEED EXTERNAL GRINDER

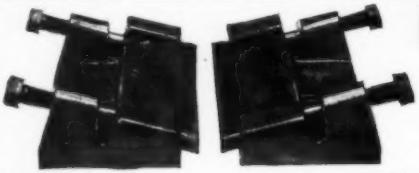
- Precision Spindle
- Power or Hand Feed
- Swivel on Grinding Head
- Swivel on Work Head
- Grinding Capacity 8"
- Cross Travel 4"
- 8" x ½" x 1¼" wheel

Send for New Grenby Catalog

No. EG-10 c

GRENBY MFG. CO.

PLAINVILLE, CONNECTICUT



HART'S DIVIDED MACHINE VISES

These Vises will hold work the full length of the table, if necessary. Useful on planer, milling machine, surface grinder or drill. They adapt themselves to any shape and can be used on sides of table as well as ends. The jaws are tool steel and hardened, the angle holding the work down on the table.

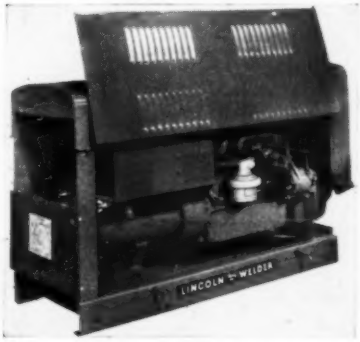
Size of Base	**5x7 inches**
Size of Jaw	**3x6 inches**
Height at highest point	**2¾ inches**

When writing for descriptive circular kindly mention the BLUE BOOK.

HART MACHINE CO.
26 Mather St., Dorchester, Boston, Mass.

Engine Driven Arc Welder

An engine driven arc welder specially designed for job welding and garage work and embodying a new system of engine-speed control for maximum fuel economy and minimum engine wear, is announced by Lincoln Electric Co., Cleveland, Ohio.



Of 200-amp. size, this d-c unit has a current range of 40 to 250 amps. It can be used for welding light gauge metal, for repairing cast iron parts such as engine blocks, for fabricating machine parts and structures of many kinds, and for hardfacing worn parts. According to the makers, it can weld practically all metals and alloys with bare or shielded arc type electrodes or with the carbon arc where desirable.

The machine's self-indicating voltage control ("job selector") and current control, it is claimed, make it easy for operator to select any type of arc and any arc intensity to suit the job, providing continuous selection throughout the range. This control directly varies speed of engine from 1800 to 1400 for welding duty, giving accurate control of open circuit voltage. In addition, the control may be used to bring engine to an idling speed of around 900 rpm so operator can manually slow the engine down whenever he plans to stop welding. Engine speed can be minimized to a rate actually required by job at hand. The welder will generate its rated current of 200 amps. at 1400 rpm and engine speeds above that are

INEXPENSIVE MICROMETERS

Sold Under a Money Back Guarantee

Complete set $19.95

Consists of: 0-1" Micrometer, Outside. 1-2" Micrometer, Outside. 2-4" Micrometer, Outside (2 thimbles). 2½-4" Micrometer, Inside (3 measuring rods). Velvet Lined case.

Write for FREE descriptive Catalog.

MICRO PRODUCTS CO.
210 JOS. CAMPAU DETROIT, MICHIGAN

only necessary for currents in excess of 200 amps.

Generator is single-operator, variable-voltage type with laminated pole pieces, increasing arc stability and simplifying welding. Unit is equipped with "dual continuous control," enabling independent variation of both open circuit voltage and welding current and producing uniform welding current for speedy welding. At the lower part of its range, it delivers a current of light penetration characteristics for welding extremely light gauge materials. At upper portion of its range, it delivers ample current for speedy welding of plates, angles and other relatively heavy jobs.

Power is provided by a Hercules industrial engine equipped with centrifugal type governor, high tension magneto with impulse starter coupling, and oil bath aircleaner.

Net weight of unit, (stationary model), is 890 lb. Dimensions: 56x37x20". It is readily portable, and hence suitable for work in remote locations.

THE HANDIEST RACK YOU EVER SAW

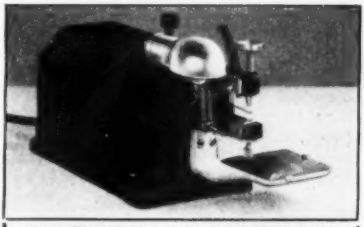
Greatest Capacity—Smallest Floor Space

4 arms, 51" high, stacks 10,000 lbs.; 5 arms, 57" high, 12,000 lbs. flat or round stock. Pipe or tube, less weight. 3 stands for 20' lengths; 2 for 12' or shorter. Use against wall or back to back in center of room. Cost is small, value big.

Write for circular and prices.

Wm. S. Yohe Supply Co.

503 Mahoning Rd., N. E., Canton, O.



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BAUSCH AND LOMB OPTICAL CO. uses VIMCOLIGHT on their Loxit Assembly Machine . . . direct, on-the-spot, non-glare illumination that helps insure true workmanship because it spares operators' eyes. Are **your** machines VIMCOLIGHTED ?

VIMCOLIGHT

VIMCO MANUFACTURING CO.

109 CHENANGO ST BUFFALO, N. Y.

NUMBERALL

Numbering Machines

Automatic and Hand Operated

for stamping in Metal, Fibre, Plastics, etc. Do faster and better work than Single Steel Stamps.

For Marking Metal Parts, Name Plates, Metal Checks, etc.

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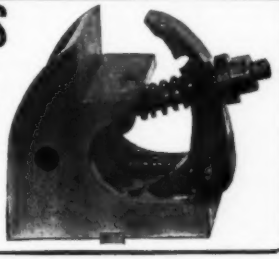
NUMBERALL STAMP & TOOL CO., Inc.

Huguenot Park, - - - Staten Island, N. Y.

HART'S MILLING FIXTURES

These fixtures will make themselves popular and profitable in your shop. Easily kept clean to receive the work. May be used in either horizontal or vertical position. Suitable to hold round, hexagonal, octagonal, or square stock, aligning the work with the machine. Grip holds the work on the bottom as well as on the back. Shipped in pairs, unless otherwise ordered. Made in 4 sizes—¾" to 4".



HART MACHINE CO.

26 MATHER ST., DORCHESTER, BOSTON, MASS.

100th Anniversary Steel Stock List

Of more than usual interest to steel users is the recently published Ryerson 100th Anniversary Steel Stock List. Issuance of this 268 page catalog data book marks observance by the company of their 100 years of steel service to American industry.

In addition to a full listing of the more than 11,000 different kinds, sizes, and shapes of steel bars, shapes, plates, sheets, tubing, cold finished, alloy, tool and stainless steels normally carried in stock for immediate shipment, the list contains a brief history of the growth of the organization from a small iron store in 1842 to a group of 10 large plants.

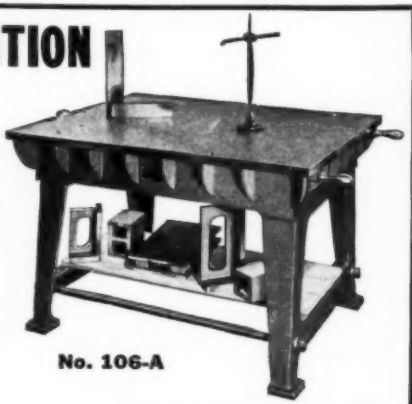
Steel plays a most important role in our war efforts. With many types and sizes not available, the need of up-to-the-minute information on alternate sizes and substitute qualities is highly essential to those struggling with steel problems.

The List can be obtained without charge by writing to Joseph T. Ryerson & Son, Inc., at Chicago, Milwaukee, Detroit, St. Louis, Cleveland, Cincinnati, Buffalo, Philadelphia, Jersey City, or Cambridge.

A USEFUL ADDITION

Modern precision machine shops and inspection departments will find this sturdy 36"x 48" MILWAUKEE SURFACE PLATE a valuable addition. Constructed of semi-steel, accurately machined, securely mounted on cast legs which are machined and provided with SAE adjusting screws for perfect alignment. Height from floor to top of plate 30". Shipping weight 1200 lbs.

We also manufacture angles and parallels as shown underneath surface plate.



No. 106-A

We also make larger and smaller plates either with planed or scraped surfaces, whichever is desired. *Write today for full information.*

J. C. BUSCH COMPANY ENGINEERS AND MACHINISTS SINCE 1907

165 SO. BARCLAY ST., MILWAUKEE, WIS.

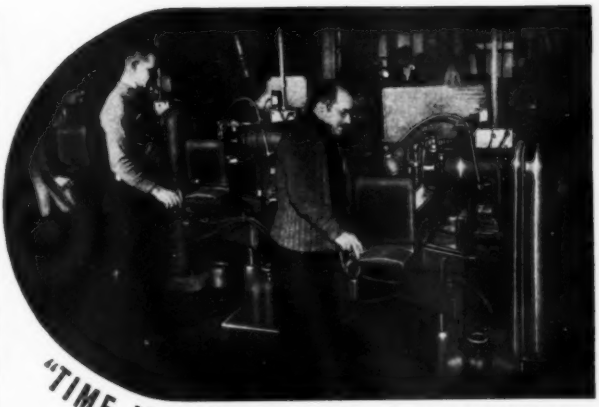
Lighting

America's war effort has raised lighting levels in modern defense plants 4 times their peacetime strength to speed production and protect the nation's industrial workers against eye strain caused by overtime hours. The subject of industrial lighting was discussed by S. G. Hibben, Westinghouse director of applied lighting at a recent meeting of the American Optometric Ass'n. in New York.

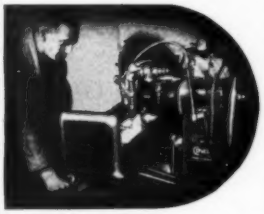
Widespread vision defects during the first World War were caused by poor industrial lighting. During this emergency, industry is making every effort to safeguard American workers. Modern plants have increased lighting levels from an average of 10 footcandles to 40 and 50 footcandles, the new standard for adequate illumination. These new levels are 13 or 14 times greater than the average of 3 footcandles used by industry from 1914 to 1918.

Much of the present illumination increase has resulted from development of the fluorescent lamp, a slender glass tube which emits cool, economical light through the action of ultraviolet on a coating of chemical phosphors. More than 20,000,000 fluorescent lamps were installed in factories and offices during 1941.

Improved industrial illumination is not the whole answer. The average worker returns at night to an inadequately lighted home. His children are educated in poorly lighted classrooms. Lighting of the entire nation must be raised to keep in step with the demands which modern living habits impose on the eyes.



"TIME IS SHORT".....So Let's SAVE It!



Save valuable hours with the Covel No. 15 Hand Feed 6"x18" Surface Grinder—Indispensable in Defense industries where quick set-up is essential. Simple to set-up and easy to operate, No. 15 saves precious production hours for you week after week. AND you save on the low purchase price and operating costs. Covel is ready NOW for prompt delivery on this No. 15 Hand Feed Surface Grinder.

Write, wire or phone TODAY for Bulletin MT32 and name of nearest dealer.

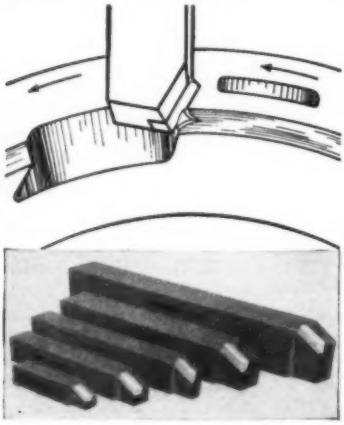
Grinding Machinery Since 1874

COVEL INDUSTRIAL GRINDERS

COVEL MFG. CO., BENTON HARBOR, MICH.

New Kennametal Designs

The McKenna Metals Co., 135 Lloyd Ave., Latrobe, Pa., announces new styles of Kennametal-tipped tools especially designed for interrupted cutting of steel castings and forgings in lathes, boring mills, shapers, and planers. They are designed to speed up production in machining armor plate, tank parts, and other irregular shapes of steel castings and forgings. It is asserted that these new Kennametal tools with the unique negative shear angle of 35° combined with a positive side rake of 15° (see illustration) will permit the same economy in machining irregular sections as has been realized hitherto in simpler jobs cut with Kennametal.

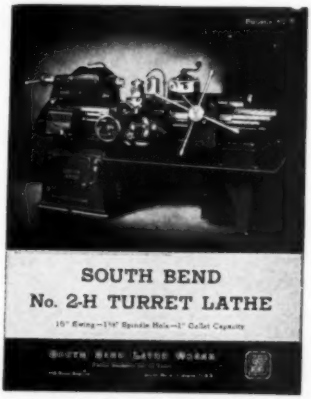


The principle of these new tools, known as Kennametal styles 35, 36, 37, and 38, is that the interruption on the work first strikes the tool at a place back of the extreme point, where the cutting edge is mechanically strong, and then shears off the chip with a progressive action (see illustration). These tools are made in opposite hands. The tips are longer than on other standard Kennametal tools to compensate for the foreshortening of the 35° shear angle; they project above the shank at the back to allow sufficient steel under the point.

Turret Lathe Bulletin

The new South Bend No. 2-H Turret Lathe is described in Bulletin No. 67-T, recently announced by the manufacturer.

This 4-page, letter size, bulletin is a condensed catalog which may be conveniently filed for ready reference. In it the Turret Lathe is fully illustrated and described. Complete specifications are given and construction features are shown.



This new lathe is adaptable to either long run or small lot production on a wide range of bar, chucking or fixture jobs. It has a capacity of 1-$\frac{3}{16}$" through spindle hole, 16" swing over bed and saddle wings and 1" through collet.

Bulletin 67-T will be mailed on request from South Bend Lathe Works, Dept. M6, South Bend, Ind.

OPTICAL COMPARATORS
* * *
MILLING MACHINES
* * *
ROTARY SURFACE GRINDERS
Write
PORTMAN MACHINE TOOL CO.
Mount Vernon, N. Y.

Die Design

A second edition of "Die Designing and Estimaitng" is announced by American Industrial Publishers, 332 Fairmount-Cedar Bldg., Cleveland, O. at $3 plus postage. It contains text from both "Die Designing" and "Die Estimating," completely revised, along with several entirely new chapters including one on progressive dies by Ernest Mehwald. The new drawing dies chapter is given over largely to cartridge case design.

The section on die estimating is said to be the only material in print on the complete practical method of estimating die shop operations. The section "Practical Points on Die Design and Construction" is described as the largest check list of its kind.

"Die Designing and Estimating" contains 15 new estimating tables, a separate index of time value tables, and a new chapter on compound dies. Particularly timely is the outline of equipment and operations required for the manufacture of small calibre cartridge cases (.30 to .40 mm).

The many subjects treated in this valuable handbook include blanking dies; piercing dies; cutoff dies; flange trimming dies; curling and shaving dies; block and pad forming dies, either universal or adjustable; and side or cam action dies.

The chapter on elementary solid forming dies covers single and double "V" dies, acute angle and flattening dies, right angle forming dies, offset bending dies, U-bend dies, beading and wiring dies, and channel forming dies.

Above: Cutting keyways on compound angles

Below: SLOTMASTER installed on a round overarm milling machine.

SLOTMASTER

eliminates many costly set-ups and hand operations

A slotting head that can be used on milling machines provides double duty facilities at a minimum of cost. It requires but little time to change-over from one head to the other and back again . . . The stroke of the ram is adjustable from 0 to 4" . . . the speeds range from 50 to 250 spm . . . The tool holder, of the clapper-box type, can be turned in many position . . . All of the working parts are of tool steel heat treated and ground to close tolerances . . . SLOTMASTER comes with pulleys, motor, belt and with mounting adaptable to round overarm or other milling machines.

Send for 4-page catalog and give the specifications of the milling machines that you wish to equip.

EXPERIMENTAL TOOL & DIE CO.

12607 Greiner Detroit, Mich.

G-H Balanced Hydraulic Valve

Strenuous and tiring valve-lever manipulation and a tendency toward "pressure-locking" have long been troublesome obstacles to users of hydraulic power at pressures of 1,000 lbs. or more. A new type of high-pressure hydraulic operating valve, claimed to overcome these obstacles, has been announced.

The makers emphasize that because the hydraulic pressure inside of this new type valve is always balanced, it can never become "pressure locked." The lever is just as easy to operate from either "On" position as from "Neutral." As a result, it is asserted that this valve greatly steps up the productivity of high-pressure hydraulic machinery and eliminates undue fatigue on the part of the operator even when the valve is manipulated rapidly for hours at a time.

The valve has only one moving part. This fact, together with its simplified design, is said to make it practically wearproof, doing away with nearly all maintenance expense. Built in 4 sizes to fit the most common sizes of hydraulic pressure lines, 3/8", 1/2", 3/4" and 1", these valves may be specified as replacements on most types of hydraulically operated machinery.

Known as the Nopak Hy-Pressure Hydraulic Valve, the new product is described and illustrated in a small folder issued by its manufacturer, the Galland-Henning Mfg. Co., 2754 S. 31st St., Milwaukee, Wis.

CERRO ALLOYS for Prompt Shipment

CERROMATRIX (Melting Temp., 250° F.) For securing punch and die parts, anchoring machine parts without expensive drive fits, for engraving machine models, stripper plates, chucks, short run forming dies and other metal working applications.

CERROBASE (Melting Temp., 255° F.) For reproducing master patterns, models for electroforming, engraving machine models, proof casting for forging dies, etc. Perfect reproduction of intricate detail.

CERROBEND (Melting Temp., 158° F.) Used as a filler in bending thin-walled tubing to small radii. Easily removed in boiling water. Also used for aircraft assembly jigs, templates for forming dies and other purposes.

These three low-temperature-melting and expanding alloys are helping to speed up production of war materials for the Army, Navy and Air Force.

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Ansonia, Conn., Jackson Associates
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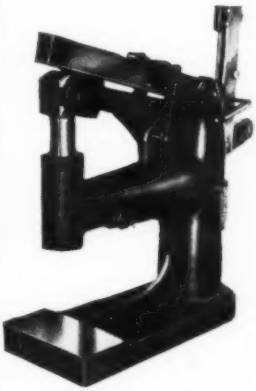
CERRO DE PASCO COPPER CORPORATION
40 WALL STREET - - - - NEW YORK, N. Y.

S-P-E-E-D PRODUCTION

AUTOMATIC
STAKING MACHINE



SPEED DEFENSE PRODUCTION—Ideal for staking and riveting when absolute accuracy and uniformity is required. Hammer strikes uniform blow at all times. Variation in thickness of material does not affect riveting pressure. Tools are held in position same as on a punch press. Work is held in place by a pad, and blow is struck on staking tool. Weight of blow is adjustable and is constant after setting. Machine available in three sizes. Write for illustrated folder.

WEBER MACHINE CORP.
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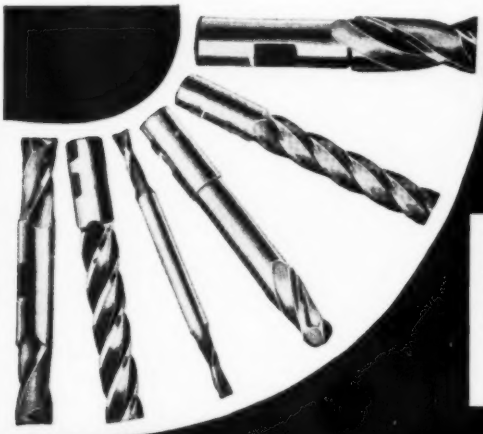


Shear Cut—
High Speed

END MILLS

Shear Cut End Mills are offered in all standard sizes, single and double end.

Write for catalog and prices today.

PROGRESSIVE TOOL & CUTTER CO.
2345 WOLCOTT ST., FERNDALE, MICHIGAN

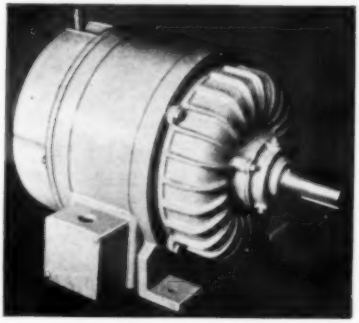
Totally Enclosed Torq Motor

A new type EA, totally enclosed, polyphase, fan cooled motor has been developed as the power unit on Torq-Qua-Matic machine tool motorizing equipment.

This squirrel cage type motor is built to N. E. M. A. specifications. The stator frame, due to the particular welding process employed to maintain stack tightness without rivets, is said to combine great rigidity and strength. The stator core is made up of 25 gage high silicon steel, punched and annealed to reduce iron losses.

The all-welded copper rotor is dynamically balanced on a high tensile alloy steel shaft of liberal size, which is turned and ground to close tolerance. Ball bearings are used throughout.

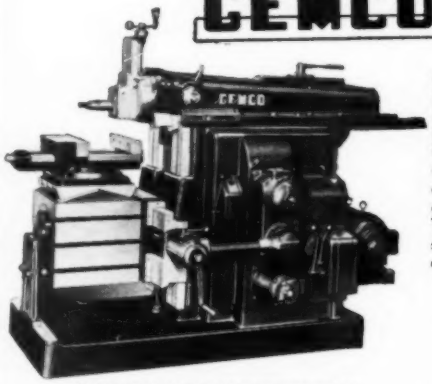
Being completely enclosed, the windings of this new motor are said to be fully protected against dirt, dust and grime. Moreover, it is claimed that the blasts of cooling air circulated around the inner casing by a carefully designed fan keeps the motor running cool under heavy loads.



EA Motors are built in sizes from 1 to 15 hp and now are available for current deliveries.

Manufacturer — Torq Electric Mfg. Co., 6605 Carnegie Ave., Cleveland, O.

GEMCO MULTI-PURPOSE SHAPERS



Available in Plain, Production, and Universal types and various sizes. Noteworthy features include: independent power rapid traverse, helical gear ram drives, centralization of controls, circulating force feed lubrication in conjunction with "Lubrigard" automatic safety device, Timken Roller Bearings, automatic self-cleaning oil filter, powerful swivel vise, large direct reading dials, etc.

Write today for descriptive literature and name of nearest dealers.

Territories available to active dealers.

"LUBRIGARD PROTECTED"

General Engineering & Mfg. Co.

ST. LOUIS :-: MISSOURI

Plastics

A year ago, as many metals began to placed under priorities, plastics were acclaimed as practical replacements in many cases. Plastic production increased tremendously — as much as 200% in one type according to the DuPont Co.

But as plastics became more widely used in the war program, raw material shortages developed, and additional manufacturing equipment could not be obtained, so plastics also were put under priorities.

Many new uses of plastics have been discovered during the past year. Lucite has been used for hairbrush backs, and a new acetate molding powder composition for toothbrush handles, combs, etc.

Nylon in large filaments has recently been adapted for use in tennis and badminton racket strings, fishing leader material, and bristling material for a wide variety of household and industrial brushes, including dairy, gun cleaning, and confectionery brushes. It is estimated that nylon bristled 90% of all higher priced toothbrushes and 50% of all hairbrushes. This use of nylon increased 63% above a year ago.

Another recent survey showed 39 plastic parts on a composite electric refrigerator, more than 30 on a radio, and varying from scores on small airplanes to hundreds on large airships.

Lucite has been used in increasing amounts for windshields, windows, turret, navigation "blisters" and other parts of modern aircraft because of being so highly weather resistant and is contributing its part to the war effort,

Plastics research facilities have been greatly enlarged. Approximately a third was added to DuPont's facilities by the opening of a new laboratory in New Jersey last October.

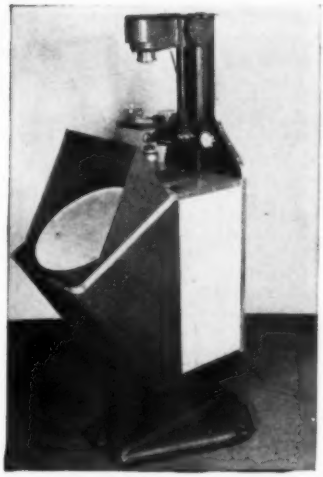
Streamlining
FUSE CAP ASSEMBLY
● Efficiency of Galland-Henning Nopak power screw drivers in munitions production is streamlined with Norgren Lubrication.
—If you use air power, you need NORGREN LUBRO-CONTROL Units
They create a fog of oil, carried by the air which drives the cylinder, valve, chuck, or other air-actuated member. Thoro: oils every working part. Automatic: works only when tool works.
GET CATALOG 400 TODAY
C. A. Norgren Co.
200 SANTA FE DRIVE
DENVER, COLORADO

Portman Optical Comparator

A new Optical Comparator is announced by the Portman Machine Tool Co., 17-19 Beechwood Ave., Mount Vernon, N. Y.

The new Comparator is substantially constructed and is suitable for use in shop, tool room, laboratory or production departments. Objects to be measured, inspected or compared, are simply placed on the work rest member of the stage.

One of the special features embodied is the utilization of dove-tailed ways on all moving parts. The optical system permits ready change of image magnifications. Comparator is available with plain type stage unit, or may be equipped with a coordinate stage unit consisting of movable members for sidewise and forward travel. The coordinate stage unit includes dial type indicators reading in .001" for rapid visual detection of object errors



The operating simplicity is claimed to be such that inexperienced operators may be employed for the most critical inspection operations. Standard magnifications available are: — 10, 20, 30, 31¼, 45, 50, 60, 62½, 80, 100.

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LINE OF FLEXIBLE SHAFTS, SAWS AND HOLE CUTTERS.

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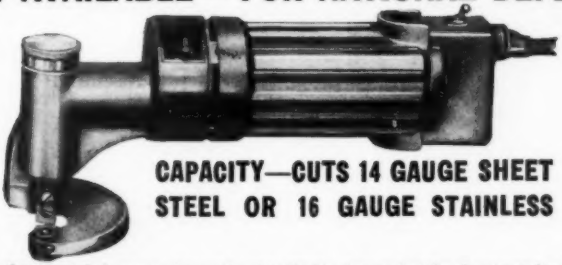
"STACKED AND STILL ACCESSIBLE"

GES *Electric Hand Shears*

NOW AVAILABLE — FOR NATIONAL DEFENSE



CAPACITY—CUTS 14 GAUGE SHEET STEEL OR 16 GAUGE STAINLESS

This new sheet metal shear was brought out to fill the demand of the sheet metal industry for a very light weight but powerful, fast cutting tool, capable of cutting accurately to the line along straight lines as well as along small curves.

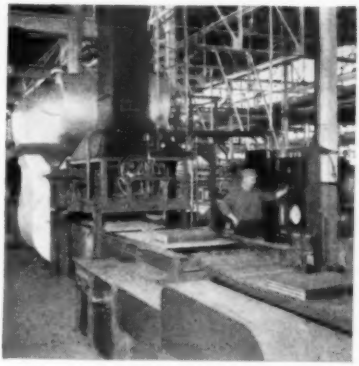
This sturdy shear will give a life time of service. The ball bearing "Grip" type Universal motor ⅛ horse power will operate on either AC or DC and 110 or 220 volts, 25 to 60 cycles. This new model has fuse protection incorporated in switch box. Alloy Steel cutters—will cut at the rate of 6' 6" per minute on 14 gauge sheet steel. *Write for further information.*

James W. George Machinery Company

3146 EAST JEFFERSON AVENUE, DETROIT, MICHIGAN

Automatic Soldering

An automobile radiator involves an intricate maze of copper tubes and fins—requiring a countless number of soldered joints. This complicated soldering job is now done automatically instead of by hand. Assemblies of copper tubes, fins, and solder are placed in position on an electrically operated conveyor in the plant of the Fedders Mfg. Co. The conveyor, a product of Mechanical Handling Systems, Detroit, then takes over the job. First the assembly passes through a flux spray and then on into an oven. The oven-heating cycle is operated in synchronism with the conveyor movement using Westinghouse electrical controls. After a fixed time in the oven, long enough to bring the solder to a flow point, the conveyor starts again and moves the radiator core into a press, where it is held flat and square while an air blast cools it and solidifies the solder. This air blast is also controlled automatically in time with the conveyor and press movement. After the core is sufficiently cooled, the press opens and places the core again on the conveyor which delivers the finished core at the discharge end.



The entire operation is automatic, likewise the entire operation of the press and both are controlled in sequence with the intermittent movement of the conveyor.

Eliminate Those Bottlenecks In Your Tool Room
Install One Or More Oliver Die Making Machines

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You can use less skilled mechanics and you will obtain better work in less time.

"A real time and money saver".

* * * * *

Every productive hour counts today so start in the tool room and on your production filing jobs to save 50 to 60% over hand methods.

SEND FOR LITERATURE

OLIVER INSTRUMENT CO., 1408 Maumee St., Adrian, Michigan

Sub-Contracts

Fourteen permanent sub-contracting exhibits are now in operation in industrial centers of the nation. They show small manufacturers how to turn their facilities to war production and help prime contractors and the government find additional manufacturing facilities.

About a thousand small manufacturers a month visit the Detroit showroom, 7310 Woodward Av., to see the samples and blueprints of needed war materials on display and to talk to prime contractors and government engineers.

Many make these trips regularly, for this showroom is kept up to the minute with the rapidly changing and expanding war demands. From 20 to 25 prime contractors keep their vitally needed parts on display.

Efforts are made to avoid the display of "dead" items. American Locomotive Co., for instance, has on display parts needed in the production of tanks. Packard Motor Co. displays bronze bushings needed for an airplane motor. There is a complete showing of gears, airplane shock struts, etc.

Other sub-contracting exhibits will be found at these locations:—Boatmen's Bank Bldg., 420 Locust St., St. Louis; Broad St. Station Bldg., Philadelphia; Chanin Bldg., 122 E. 42nd St., New York; Western Pacific Bldg., Los Angeles; Union Commerce Bldg., Cleveland; Civic Opera Bldg., Chicago; Mutual State Bldg., 5th floor, Atlanta; Canal Bldg., 7th floor, New Orleans; Whitcomb Hotel, San Francisco; Sterick Bldg., 18th floor, Memphis; White Bldg., 4th floor, Buffalo; Globe Indemnity Bldg., 20 Washington Pl., Newark; Court St. Branch, 1st Nat. Bank, 17 Court St., Boston.

BUY 3 SANDERS FOR THE PRICE OF ONE!

In Metal Working: Sterling Engineers are a concentration of fast, economical QUALITY metal finishing experiences—experience gathered in the finest plants across America. Ask to see a Sterling man!

HAND-sanding takes a lot of man-hours—and good hand-sanders are hard to find. But with "SANDY" you can turn almost any man into an expert—and he will do 3 TIMES THE WORK of the former man!

"SANDY" is perfect for metal, wood or composition finishing; for wet sanding, feather-edging and clean-up — AND he works 3 times as fast even in the hands of an untrained man.

"SANDY"—THREE MEN IN ONE! GET PROOF by ACTUAL DEMONSTRATION IN YOUR OWN SHOP!

"SHORTAGES" DEMAND THAT YOU ACT NOW!

WRITE!

FREE—Send for "Hints on Sanding Savings" TODAY! Address Sterling Tool Products Co., 363 E. Ohio St., Chicago, Illinois. Don't delay! Write at once! Only a limited supply of this valuable leaflet remains.

Sterling
TOOL PRODUCTS CO.
369 E. Ohio St., Chicago, Ill.

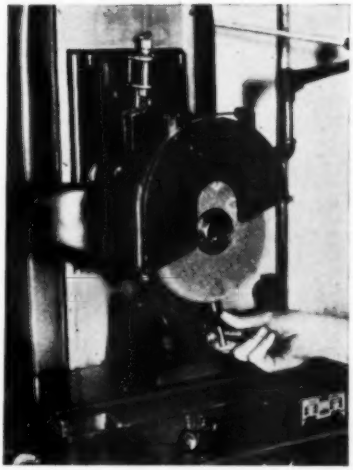
"Little Wonder" Radius Dresser

Latest in the Scherr line of machine tool accessories is the Little Wonder Radius Dresser, designed to speed up and simplify the dressing of grinding wheels for various types of grinding work.

The device is used in conjunction with a diamond tool to dress wheels preparatory to grinding forming tools, fillets, end mills, and for grinding rake angles on collapsible tap chasers. It will dress either convex or concave radii from 0—1" and can be set with regular 1" micrometer, depth micrometer or height gage.

Base is made of cast iron especially alloyed, rough machined and normalized before finishing, to prevent changing. Swinging arm is made of cast iron and heat treated before finishing. Centers are turned at both point and sides, hardened and lapped true.

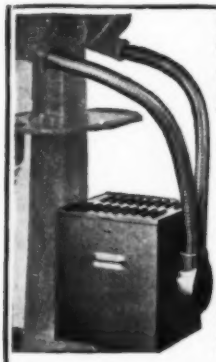
For full information regarding the new Dresser and applications in daily grinding operations address George Scherr Co., 122 Lafayette St., New York, N. Y.



Ohmite Rheostat Cages

A variety of Rheostat Cages have been developed for use with Ohmite Rheostats by the Ohmite Mfg. Co., Dept. 2F, 4835 Flournoy St., Chicago. A cage enclosure is a convenient form of table top or surface mounting and is advisable where there is possibility of mechanical injury to the rheostat or human contact with electrically "live" parts.

Ventilated cages with perforated sides are most generally applicable. Other types are available — dustproof cages, cages to house rheostats in tandem, explosion proof cages, ventilated cages with one-half closed as a splash guard, and a laboratory type semi-enclosed table-top cage. Various types of terminals can be supplied.



STOP DUST

Entirelyself-contained, (motor, fan, filter, etc.) low cost, portable DUSTKOP, Model 600.

Capacity: 600 Cfm. Has ¼ HP, GE 110 Volt, Single phase, continuous duty motor. Air laden dust is stopped by horizontally placed spun glass filter, drops back into removable dust pan. Widely used on defense work on bench and pedestal tool, surface, cutter grinders, etc.

AGET-DETROIT MFG. CO.
964 BOOK BLDG. DETROIT

Yes sir! Here IS a Surface plate! 6X14 ft.

PRECISION SCRAPED

Despite its gigantic size, this surface plate like all its smaller counterparts) exemplifies precision of a very high degree, over every inch of the surface from the center to the very edge.

Built of Meehanite—a specially processed iron recognized for its strength, uniform texture, and solidity through all sections. The design of this plate will prevent distortion or changes after once being scraped. All our plates resist deflection under reasonable load and retain their accuracy, due to the special form of ribbing that supports them. Ample clamping space is provided all around the edges.

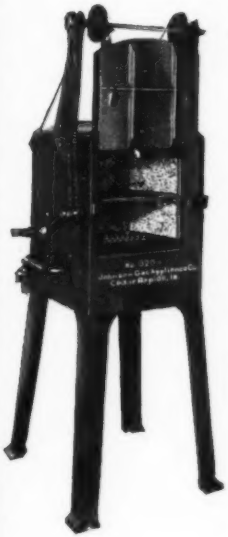
Sizes range from this large fellow illustrated above, 72 x 168 inches, down to 10 x 15 inches.

To keep plate level and flat, we have developed a specially constructed standard provided with unique supports. These supports, locked to a fixed position, are designed to withstand vibration.

Send for complete folder describing sizes and quoting prices.

MACHINE PRODUCTS CORPORATION

6767 McNichols Rd. Detroit, Mich.



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FOR MORE THAN 40 YEARS

A NEW Furnace on the Firing Line!

TEMPERING and DRAWING Furnace 820

A New ideal production furnace from JOHNSON, — for all jobs requiring a temperature range from 275 to 1200° F. Use it for speedy tempering of tools, dies, small parts, non-ferrous castings and parts. It's compact, requires little floor space, and is easily moved.

No. 820 is a rugged unit—built to stand up under today's hard use. Heavily lined with insulating refractory; equipped with 2 large Johnson atmospheric burners. The counter-balanced, self-aligning door is sturdy and well-insulated, reducing heat loss; easily controlled by crank. Equipped with 2 Allegheny metal shelves. Economical to operate, with remarkably even heat thruout combustion chamber. Firebox 16"x16"x14".

SALES OFFICES: Bourse Bldg., Philadelphia
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C. B. Babcock Co., 475 11th St., San Francisco

FREE: Full information and Catalog. Just Write —

Johnson Gas Appliance Co., 554 E Ave. NW. Cedar Rapids, Iowa

Mechanics Through the Ages

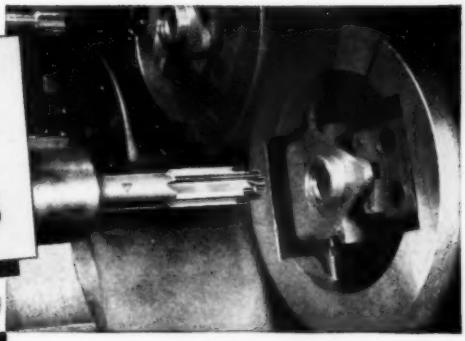
A BREACH-LOADING CANNON EMBODYING, IN A RUDE FORM, PRINCIPLES STRIKINGLY SIMILAR TO THOSE DEVELOPED BY SCIENTISTS AS LATE AS THE 19th CENTURY-WAS RAISED FROM A SHIP SUNK IN THE ADRIATIC SEA CENTURIES EARLIER!

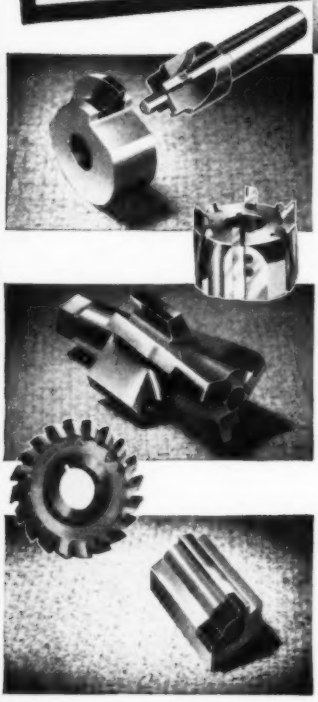
ONE OF THE WORLD'S "LOST ARTS" WAS THE METHOD USED BY THE ANCIENT EGYPTIAN CRAFTSMEN OF MAKING TOOLS OF COPPER CAPABLE OF TAKING A KEEN EDGE.

THE FIRST MAN-MADE ABRASIVE—CARBORUNDUM—WAS BORN IN MARCH, 1891, AT MONONGAHELA, PENNSYLVANIA, WHEN DR. EDWARD G. ACHESON PASSED AN ELECTRIC CURRENT THROUGH A CHARGE OF CLAY AND COKE IN A TINY ARC FURNACE HE RIGGED UP OUT OF AN ORDINARY PLUMBERS' SOLDERING BOWL. WHEN DR. ACHESON APPLIED THE TINY CRYSTALS TO THE OILED SURFACE OF A REVOLVING IRON DISC, HE WAS ABLE TO CUT THE FACE OF A POLISHED DIAMOND.

Special

CEMENTED-CARBIDE TIPPED CUTTING TOOLS





Produced *Exactly* to Your Specifications . . Delivered Promptly

The Morse Tool Company, over the past few years, has manufactured thousands of special cemented-carbide tipped cutting tools. Wherever they have been used, they have done their job extremely well. For that reason, the demand for them necessitated the expansion of facilities to manufacture tools of this type. A new and entirely separate division was formed under the name of Carbide Fabricators.

Today, Carbide Fabricators occupies a modern, spacious plant in which all equipment is devoted to cemented-carbide work . . . providing the means to turn out tools of exceptional accuracy and quality and to eliminate long delays in delivery. We will welcome the opportunity to tell you how we can meet your requirements during the present War Program. Your inquiries (accompanied by blueprints) will receive prompt attention.

We are authorized suppliers of Carboloy, Firthite and Vascoloy-Ramet cemented-carbides.

And a Complete Line of Standard Tools

Carbide Fabricators stock a complete line of standard cemented-carbide tools. Pricing is simplified so that the same low unit cost prevails for tools ordered in any quantity. WRITE FOR OUR NEW CATALOG.

Carbide Fabricators BERKLEY MICHIGAN

DIVISION OF MORSE TOOL COMPANY - DETROIT

The New

LIBERTY

HIGH SPEED GRINDING ATTACHMENT

The NEW LIBERTY high speed grinding attachments are designed for quick simplified setups for best results in tool room, and are excellent for grinding gages, angles, slots, recesses and surfaces which are either impossible to get at with a large wheel or require difficult and long expensive setups in which small wheels are a necessity.

Designed for the most accurate service in grinding tools and various kinds of mechanical equipment.

Send for circular giving full details.

LIBERTY TOOL & GAGE

235 GEORGIA AVE. **WORKS** PROVIDENCE, R. I.

Industrial Brush Helps Speed Defense Work

A new type Tampico fiber industrial brush, has been announced by Osborn Mfg. Co., Cleveland, O. The product is expected to help speed war production in many industries, including

automotive, aircraft, shipbuilding and others requiring brushing equipment to remove burrs, polish or form metal parts, or to finish welded seams.

Used with the proper abrasives, this Tampico Section, will remove tool

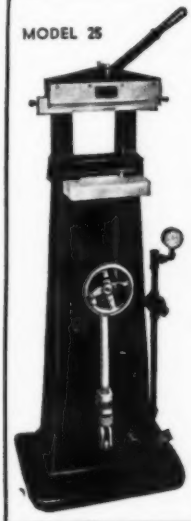
WIREGRIP Belt Hooks —6 sizes of tough hooks conveniently carded. **No waste.** Makes smooth humpless flexible joint on all flat belts.

STEELGRIP Lacing — 8 sizes, applied with a hammer. For all flat belts on tough drives. Prevents end fraying.

Here at one source are all belt lacing needs, dependable satisfactory products of guaranteed material and workmanship. *Write for Catalog.*

ARMSTRONG-BRAY & CO.
"The Belt Lacing People"
5364 Northwest Highway,
Chicago, U. S. A.

MODEL 25



MARK YOUR PARTS

Permanently

PART NUMBERS, CATALOG NUMBERS,
HEAT NUMBERS, SERIAL NUMBERS,
PATENT NUMBERS
MANUFACTURER—INSTRUCTION DATA—INSPECTION

Positive, Permanent marking on your products assist prospects to order. Makes it easier to buy—new, repeats and repairs. Gives you a definite record of pertinent data on each part produced.

The Pneumatic marking machine illustrated is our HI-DUTY model 25 general purpose tool for short runs or production work. It operates from your shop air line and is one of numerous models built to produce neat, permanent markings quickly on metal fabrications.

We will be happy to make specific recommendations upon receipt of samples or prints of parts to be marked, showing approximate lettering, its location on the part, with required hourly production.

MARKED PARTS ADVERTISE
IN THE RIGHT PLACE, AT THE RIGHT TIME.

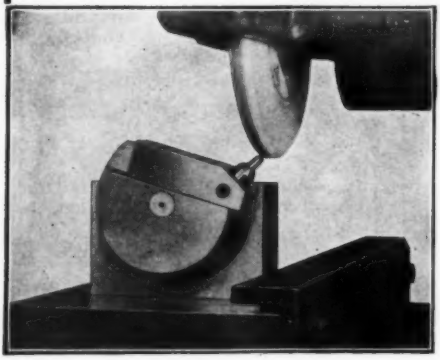
Send for complete catalog of our full line of marking Tools, Machinery and Equipment.

GEO. T. SCHMIDT, Inc.

1802 Belle Plaine Ave., Chicago, Ill.

Speedy!

The WELCH Quick Angle Dresser speeds up the accurate dressing of grinding wheels to any required angle. It is quick and easy to use . . . accurate and precise in the results obtained.



Precise

The WELCH Quick Angle Dresser is available in plain or vernier types. Revolving dial on the plain type is graduated in degrees and the zero line is on the base block.

Vernier type has the same graduated revolving dial, with vernier cut into the base block. This is an unusual feature and precludes possibility of the vernier being moved.

After setting dresser to the required angle, tighten knurled hand knob and dresser is ready for use.

Vernier type dresser, complete with one diamond **$82.50**

Write TODAY for full information and prices.

Welch Industries Incorporated
Makers of HIGH SPEED MILLING CUTTERS
FORM TOOLS and SPECIAL TOOLS
19900 W. Eight Mile Road
DETROIT, MICHIGAN

marks from aircraft motor parts, such as connecting rods, tappets, cams, etc., according to the company's engineers. Another application of the section is the slight rounding of corners of different motor parts, gear teeth and similar products. Brush will remove burrs without damage from metals such as aluminum and Alclad when used without abrasives.

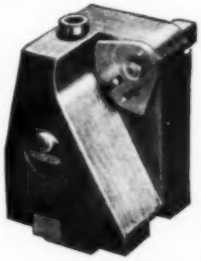
As explained by the makers, announcement of product followed discovery of the fact that material used in the treatment spaces fibers to a definite relationship, one with the other, and eliminates tendency of fiber to group or "knife" at high speeds.

The brushes are available in diameters of 4, 6, 8, 10, 12, 14, 15, and 16".

Circular Forming Tool Holder

A newly-developed circular forming tool holder for use on turret lathes is announced by Gisholt.

The device has been designed for use on either front or rear of the cross slide, since cutters may be mounted on either side of holder. Provision has



been made for adjusting and locking cutter so cutting edge can always be properly positioned after grinding. A further feature is the pivot mounting of the holder, the pivot having an adjustment for correcting slight inaccuracies of cutter.

For further information write Gisholt Machine Co., 1185 E. Washington Ave., Madison, Wis. Specify the make and model of turret lathe.

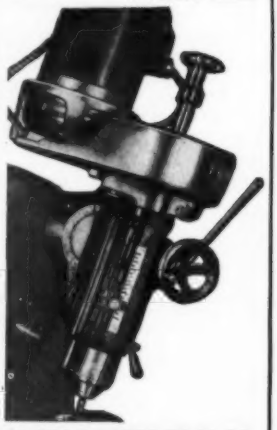
EKLIND UNIVERSAL MILLING HEAD

CAN BE ADAPTED TO ANY MACHINE

MILLS DRILLS BORES at any angle

Speeds from 250-4000

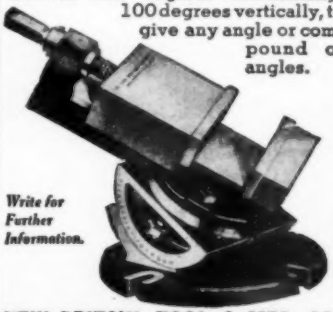
Write for Circular



UNIVERSAL HIGH SPEED TOOL CO.
551 W. Washington Blvd. Chicago, Ill.

New Britain
UNIVERSAL VISE

Swivels 360 degrees horizontally, 100 degrees vertically, to give any angle or compound of angles.



Write for Further Information.

NEW BRITAIN TOOL & MFG. CO.
NEW BRITAIN, CONN., U. S. A.

PROMPT DELIVERY

Few Territories Available.

DYER

Heavy Duty Spot Welders

Floor models 10 to 35 KVA.

6 point selective switch on all floor models allows for quality welds on various materials. Standard and Underwriters Labeled Machines.

3 point switch on bench models.

Bench models 2½ to 10 KVA.—with or without pedestal.

Dyer Welders are available in a wide range of sizes and capacities—air, motor or foot operated, giving maximum production—simplicity of operation—power economy.

The Topeka Foundry & Iron Works Co., **300-332 Jackson St. Topeka, Kansas**

SHEAR IT CLEVERLY WITH A BEVERLY

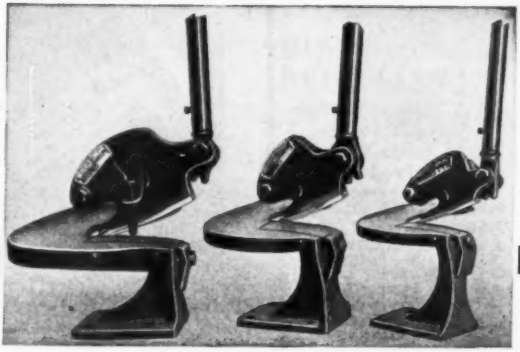
Save time—labor—money on RUSH orders! Cut metal any shape without distortion! Hair-line accuracy every time! Built to last a lifetime. Anyone can operate! Install one or more of these money makers now!

MADE IN 3 SIZES

No. 1 — cuts 14 gauge — wt. 16½ lbs.
No. 2 — cuts 10 gauge — wt. 33 lbs.
No. 3 — (Equipped with ball bearing hold-down device) cuts 3/16 inch mild steel or 10 gauge stainless — wt. 55 lbs.

BEVERLY SHEAR CO., **3005 W. 110th Place, Chicago, Illinois**

IDEAL THROAT-LESS SHEAR



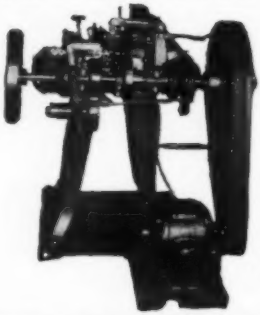
IDEAL BENCH TYPE SHEAR

Write for Prices!

Write for Catalog!

DESIGNED FOR HEAVY DUTY

THE NILSON FOUR SLIDE MACHINE

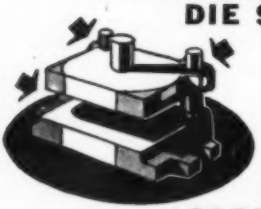


For Swaging, Stamping, Piercing, Blanking, Forming of coiled metal. One of the outstanding features of this combination power press and four slide machine is the powerful and silent action of the main press slide which is operated by crank motion through toggle or knuckle joints. Strength and rigidity achieved by overhead stay rods. Changing dies is a simple and quick operation as the removable die set is easily accessible. The gripping members are independently operated, insuring a positive pull on long or short lengths direct from the reel.

Write for further information.

The A. H. NILSON Machine Co.
BRIDGEPORT, CONN., U.S.A.

DANLY PRECISION DIE SETS



THEIR PRECISION
Means Greater Accuracy In Your Production

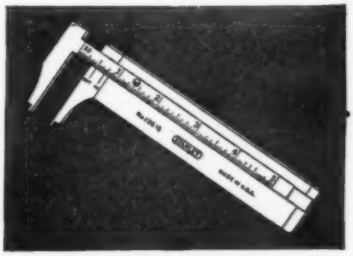
Danly Commercial Sets
Danly Special Sets

DANLY MACHINE SPECIALTIES, INC.
2100 S. 52nd Avenue, Chicago, Ill.
MILWAUKEE • LONG ISLAND CITY, N. Y.
DAYTON • DETROIT • ROCHESTER
CLEVELAND • PHILADELPHIA
Ducommun Metals & Supply Co.
Los Angeles • San Francisco

DANLY PRECISION DIE SETS

Stanley Pocket Caliper Rule

A new handy pocket size Caliper Rule for mechanics, engineers, draftsmen, estimators, etc., is announced by Stanley Tools, New Britain, Conn. It is a useful tool for measuring rods, tubing, squares, cable, rope, bolts, pipe, etc.



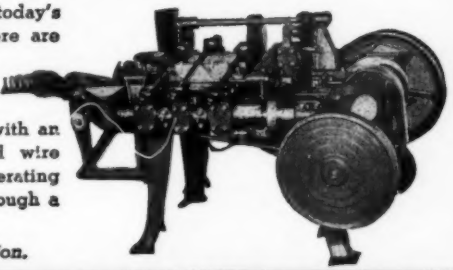
Stanley No. 136½ Rule can be used for accurate inside and outside measurements. Caliper capacity permits

BUILT FOR SPEED-DURABILITY

THE NILSON-AUTOMATIC METAL AND WIRE FORMING MACHINE

The Nilson Automatic Metal and Wireforming machine meets today's industrial requirements. Here are some of the features of this machine. Open construction of press and forming tools. Patented slide feed with an independent cam-operated wire gripping device. Power operating wire feed is transmitted through a straight line.

Write today for information.



The A. H. NILSON Machine Co.
BRIDGEPORT, CONN., U.S.A.

measuring hole diameters from 7/32" to 5", and widths or lengths up to 5". Diameters of rounds up to 3" can be measured with this new Rule.

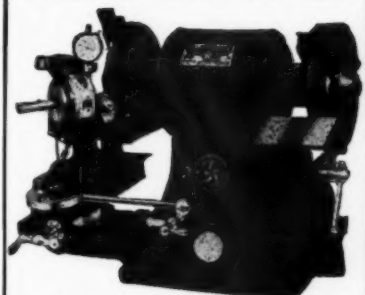
Rule is made of boxwood, with brass caliper slide graduated by 16ths and 32nds its full length of 5". Head is carefully machined. Back of Rule has vertical graduations in 16ths for easy measuring—up or down, right or left on straight surfaces. No. 136½ Rule is 5⅞" long, 1-1/16" wide.

THE PRECISION UNIVERSAL TOOL HEAD

brings all adjustments under absolute micrometric control of the operator without stopping tool or machine. In Jig Borer, Milling Machine or Horizontal Boring Mill, it bores, faces, counterbores, turns outside diameters, mills flat surfaces and slots, under-cuts, recesses, back-faces and does an almost limitless range of "headache" jobs. Send for bulletins. Address all communications, inquiries and orders to

THE PRECISION TOOL COMPANY
P. O. BOX 155, BROOKLYN, NEW YORK
Cable Address: "Pretool-New York" Tel: MAin 4-1064

Precision Drill Grinder



Simple to operate—dependable—speedy—this Precision Grinder will enable you to produce perfect points on standard twist drills in sizes from No. 41 (.096) to 5/8" (.625).

Send today for more details.

Star Machine & Engineering Corp.
Division Star Electric Motor Co.
Bloomfield, • • • New Jersey

EXCELSIOR No. 14 ANGLE ROLLING MACHINE

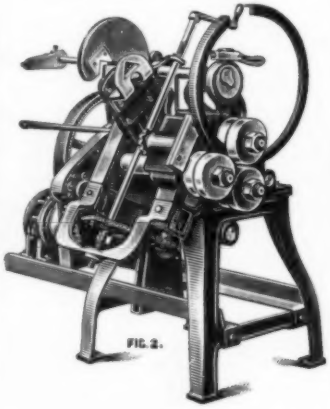


FIG. 2.

Capacity 2x2x¼" Angles. All the rolls are direct driven avoiding slipping of the material between rolls, which are operated by the oversize Excelsior friction clutch. Write for Price and Testimonials.

We specialize in Automatic Grinding and Polishing Machines, to polish Stainless Steel Sheets, Automobile Bumpers, and parts, Stove and Range Top Castings, Electric Iron Sole Plates, etc.

Also Inside Cutting Shears, Deep Throat Power Punches for duplicate work by the use of horse shoe templets up to No. 12 gauge. Used in Stove, Range, Air Conditioning and Kitchen Equipment Plants.

EXCELSIOR TOOL & MACHINE CO.

East St. Louis, Illinois

—GEARS—

Spur—Helical—Worm—Bevel—Miter, Etc.

We do broaching and all kinds of grinding.

We specialize in grinding hardened steel bushings, cam rollers, etc.

Prompt service and quality has retained a large list of customers for 25 years.

TAYLOR MACHINE CO.

1919 E. 61st St., Cleveland, Ohio

the hotel preferred

hotel metropole

a stopping place modern in every detail, yet maintaining a friendly atmosphere and hearty hospitality • preferred by experienced travelers • dining room • garage adjacent • rooms from $1.50 • with bath from $2.50

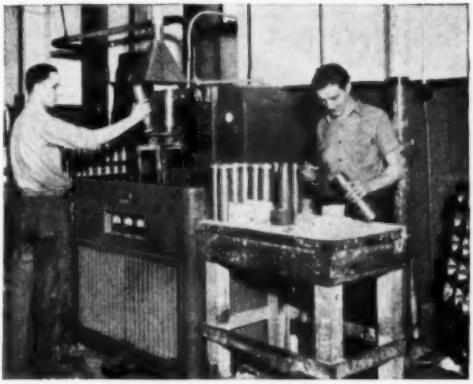
cincinnati

Induction Shell Brazing

Installation of new electrical induction heating equipment for the brazing of adapters to 75 mm chemical shells is reported to have resulted in an important speed-up in the heating time at the Armstrong Cork Co. One operator heats two shells simultaneously in 50 seconds. Former methods required at least five minutes for one shell.

This increased output is obtained on an electrical induction heating unit manufactured by Ohio Crankshaft Co., Cleveland. Tocco Process machines are thus said to be silver soldering chemical shells 12 times faster and reducing rejections. 105 mm shells are also brazed inductively.

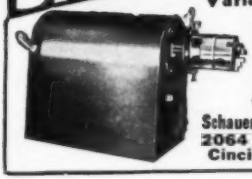
Shells are placed nose down in a twin inductor mounted on a small-sized 20 kw Tocco Junior Utility unit operating on 120 amps and 15 kilovars. The machine is equipped with a 9600 cycle motor generator set with a 220 volt hook up. Automatic controls govern the brazing cycle to a split second eliminating danger of over heating. Power costs are extremely low. Two men perform the entire fluxing, adapter-fitting, soldering and handling operation. For surface hardening, these units are readily converted by merely mounting proper inductors to transformers and by establishing the hardening heating and quenching cycle.



An important feature of the induction brazing process is control of the heat to within a ¼" band on either side of the joint. Operators can handle shells bare handed without tongs. There is no prolonged cooling-off period and uniformity marks the finished braze.

SCHAUER Speed Lathes

Variable Speed



Ideal for lapping filing, polishing small metal and plastic parts.

Write for Catalog 400.

Schauer Machine Co.
2064 Reading Rd.
Cincinnati, Ohio

SAVE Labor and Time

Eliminate heavy lifting. Cut handling costs. Table swivels and locks in any position. Can be varied 15½° by slight foot pressure, leaving operator's hands free. Engineered and built by tool engineers, experienced in production of special machines, dies, jigs and fixtures for exacting requirements.

Send TODAY for illustrated catalog No. 2.

MIDWEST TOOL & ENG. CO.
112 Webster St., Dayton, Ohio

New
INSPECTOR'S STAMPS

Faster Identification of Inspectors or Operators. Different borders may be used for different shifts. Available in 4 sizes. Write for prices today.
NEW METHOD STEEL STAMPS, Inc.
145 JOS. CAMPAU DETROIT, U. S. A.

MOREY
VERTICAL
SHAPERS

8" Stroke
12" Stroke
Timken taper roller bearings for main spindle — all others anti-friction. Accurate — simple for toolroom manufacturing. Self-contained motor drive.
Ask for Circular No. 726
Morey Machinery Co., Inc.
410 Broome Street, New York, N. Y.

Adapters are threaded and screwed into nose of shell. In the past, gases tended to leak at the joint. Now, induction brazing is reported to have completely sealed this union.

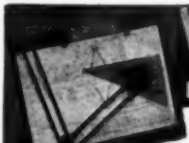
A ring-formed strip of silver solder is slipped over into the recess in the adapter. Then a thin layer of flux is brushed on and adapter screwed down tightly by hand. The threaded joint is carefully cleaned with "carbon tet" first before these operations and adapter flanges and nose face of shell are cleared of any burrs or slight nicks by filling. Grease or dirt must be avoided.

To prevent inner shell corrosion resulting from fumes created by the flux, automatic controlled air jets shoot upward into the shells and blow them free. It is stated that exposure of only 10 minutes to these caustic fumes will result in detrimental corrosion.

Each shell is tested under 100 lbs air pressure in a specially designed machine which incorporates a kerosene "bubble bath" to reveal leaks. Rejects average no more than two per thousand shells traceable in the main to a dirty seal face or thread burr.

Excess solder on the outer shell surface is turned off on an automatic lathe. The adapter joint cannot be detected in the final shell.

Induction brazing is being used for additional defense purposes such as:— brazing collars to burster tubes and brazing aviation engine accessories, fuselage parts, tubes and flanges.


Wrigraph
PRECISION
DRAFTING MACHINE
Brief Case Size Illustrated.
New large INDUSTRO Drafters available — tubular arm, ball-bearing machines. Complete range of sizes up to 36"x48".
Free trial offer and catalog on request.
Write for literature and prices on Larger Models
L·G·WRIGHT, INC.
6203 CARNEGIE AVE., CLEVELAND, OHIO

Blackouts

G - E's electric eye, is reported to have been pressed into service to black out factories and homes, eliminating the necessity of a special guard to turn off lights.

The idea was originated by Andrew Tessier, who has a small machine shop there. He could not afford to hire a night watchman to turn off his lights in case of a blackout. He turned his lights off dubiously the first night of the practice blackouts, only to have his place invaded by intruders.

Then he hit upon the idea of buying an electric eye and training it on the street light outside his store. The lights were then immediately turned off in case of a general blackout. He found the electric eye, actuated by the extinguishing of the street light, turned off the lights in his shop. In this way, Mr. Tessier had the protection of the lights being on all night, as well as the incidental advertising benefit. But he did not have the expense of an all night watchman, and was assured of immediate compliance with any black out periods.

The cost of this protection figured about $30 for the electric eye and $10 installation charge—certainly a material saving over the cost of an watchman.

In this way, the electric eye acquires another useful function in addition to its other tasks of counting traffic, opening doors for busy waitresses, discarding defective cans, calling fouls in bowling alleys, etc.

This novel use of the electric eye in automatically blacking out lights is useful not only in homes and factories, but in small stores, outdoor advertising signs, and many other applications.

During practice blackouts on the Pacific Coast, stores failing to blackout were subject to severe criticism and windows were broken by mobs to turn out their lights. Use of the electric eye of course would prevent this.

172 PAGES of Modern...

CATALOG No. 60

OIL CUPS · ·
OIL SEALS ·
LUBRICATING DEVICES

This practical

Lubricating Manual and Buyers Guide is yours without obligation. It systematically covers practically every industrial requirement in Oil Cups, Oil Seals and Lubricating Devices, together with schematic diagrams and Engineering data. Write for your copy TODAY!

GITS BROS. MFG. CO.

1860 South Kilbourn Avenue • Chicago, Illinois

30 years of oil cup experience

IMMEDIATE DELIVERY

ON THE NEW ATLAS DIE-FILING MACHINES

Can be used for all kinds of die making. The overarm is constructed so that the file and saw attachments may be interchanged with little effort. The holddown fingers are attached directly to the overarm. Working surface of the table, which tilts two directions, is entirely clear. An improved type chuck, consisting of movable hardened jaws, holds both saws and files. Screw adjustment makes changes easy and fast.

Price, complete with motor— $125.00 Net

F. O. B. CHICAGO

ATLAS EQUIPMENT CO.

103 S. Clinton St., Chicago, Ill.

Revolving Field Generators

Century Electric Co., 1806 Pine St., St. Louis, Mo., now offers new, compact, stream-lined, revolving field, alternating current generators. These generators are available in sizes from 7½ to 75 kva—4, 6, or 8 pole, 1800, 1200 or 900 rpm, 60 cycle, (corresponding speeds for other frequencies) for belt or coupling drive or flange mounting.

They are offered for continuous duty in isolated plants, or to supplement other available power supply.

The new generators are wound for the various standard voltages — single phase 2 and 3 wire, three phase 3 and 4 wire or two phase 4 wire. The neutral may be brought out for three phase 4 wire systems for light and power.

They are built to meet AIEE and NEMA voltage regulation standards. An automatic voltage regulator is generally used for best lighting service where the load fluctuates through a wide range. They can be designed for any desired value of power factor, but the regulation will be governed by the power factor.

• M-B •
Automatic Air-Line
FILTERS and
LUBRICATORS

Removes 96% to 97% of All Water, Dirt and Scale from Airline.

Air passes through a series of brass discs with .002 spacings, providing the finest degree of filtration obtainable by any known method. Then, as the air passes through head of Lubricator, oil is delivered into the purified air line in any desired volume.

ALSO PORTABLE PNEUMATIC GRINDERS

Write for FREE TRIAL Offer

M-B PRODUCTS
1311 E. LARNED ST., DETROIT, MICH.
EXPORT OFFICE
64 WHITEHALL ST.
New York, N.Y., U.S.A.

Sentries

These are critical war times, and it is more important than ever that your plant be properly guarded.

Even though a destroyed plant may be fully covered by insurance, likely the plant is irreplaceable now because of tool, material and labor shortage. And even though a plant may be only temporarily put out of commission, a blow has been struck at the war effort.

Under these circumstances, it is more important than ever that a reliable night watchman be employed. Of 188,405 watchman failures listed in a recent study, the following reasons were given: — asleep, 3088; drunk, 200; gone home, 1689; sick, 1267; overlooked time, forgot, 40,-251; late, 1184; too busy, 36,630; watching suspicious persons, 1099; lantern went out, 208; lost keys, 950; and many others.

A recent $15,000,000 Fall River, Mass. fire was due to a night watchman's losing his head and turning off the plant sprinkler system.

All too often the night watchman is an old employee who is given the last job on the payroll instead of being pensioned or laid off. It is important that watchman be not only physically able, but also that be mentally alert and have good judgment, and of course be thoroughly reliable.

In addition, he should have a complete knowledge of the plant and all its danger points, know the plant's fire protection system and where electrical switches are located, and know the location of phone, police and fire alarm boxes and fire hydrants.

(Courtesy—American Mutual Magazine)

LESLIE HAND PUNCH PRESS
MOST CAPACITY
POSITIVE ALIGNMENT

Max. cap. 2" dia. hole thru 10 ga. iron, proper shear on punch, throat depth 6". Takes punch press dies up to 3"x4½" in area. Leaf arm gives perfect alignment without ways or leader pins. Portable.

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LESLIE WELDING CO.
2947 Carroll Ave. Chicago

Thousands of
PRODUCTIMETERS
record **ALL-OUT PRODUCTION**

Industry knows Productimeters! Years of research and engineering are behind their speed and precision construction . . . their dependability for accurate production control. Productimeters are prepared now to answer the call on our first line of defense . . . the production machines of America.

Write today for Catalog!

DURANT MANUFACTURING CO.
1929 N. Buttum Street 180 Eddy Street

Steel-Grip Chipper's Guard

A practical, comfortable, long-wearing guard for chippers is offered by the Industrial Gloves Co., Danville, Ill. Of heavy chrome tanned cowhide split leather, it is designed for hard wear.

Mitten pattern, open end to admit full use of fingers, guard is reinforced where wear comes on palm and back with extra leather patch — insulated against heat with wool heat-breaker. Back of thumb is reinforced with extra leather. Can be worn over glove or bare hand. Supplied as pairs, all lefts, rights or any combination of lefts and rights as needed at no additional cost. Double sewed throughout for extra wear.

OPEN THE WAY TO GREATER PROFITS

BY USING S&S HINGES

BUTTS AND CONTINUOUS LENGTHS — *for* GUARDS — CABINETS — CASES — BOXES — LUGGAGE
WRITE FOR CIRCULAR
S & S MACHINE WORKS
HARDWARE DIVISION
4539 WEST LAKE STREET CHICAGO, ILLINOIS

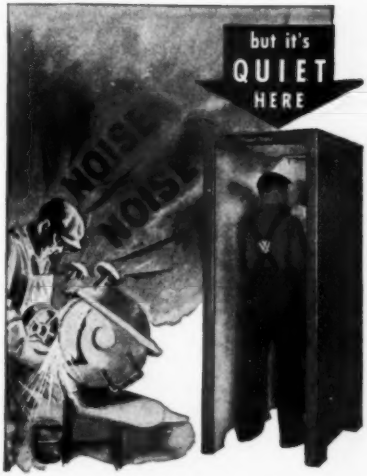
Nylen Vertical Chucking Machine

A new 6" vertical automatic chucking machine, designed to speed mass production, and simplified so that unskilled labor can turn out precision work in quantity, is offered by the Machine Tool Division, Nylen Products Co., Saint Joseph, Mich.

The new Nylen will turn and face, or bore and face, or contour and dome in one simultaneous operation. The heavy, rigid construction is said to be more than ample for the heavest cuts. The electrically operated and controlled hydraulic feed has single lever control.

The operator simply loads and moves lever up. From that point on, the complete cycle of work, including starting and stopping of spindle, is automatic. Loading is quick and easy because all obstructions are out of operator's way. Work is performed with minimum down time, and machine occupies minimum floor space.

The makers point out that a single operator can handle two or more ma-



This Acousti-Booth Provides a "Zone of Quiet" in Noisy Shops

You can have a "zone of quiet" for easy telephoning, even in your noisiest shop. It's easy—just install a Burgess Acousti-Booth. The patented, sound-absorbent interior soaks up noise. It's easy to hear inside this booth. Yet, it has no doors because no doors are needed.

No priorities needed—available without restrictions. Heavy reinforced plywood construction. Easy to use—easy to keep clean—easy to maintain. Send coupon for illustrated bulletin.

Mail Coupon for Free Booklet

Burgess Battery Company, Acoustic Division
520 W. Huron Street, Chicago

Please send illustrated booklet describing the Burgess Doorless Acousti-Booth and how it works.

Name .....

Firm Name .....

Street-City .....

Operating under Burgess Patents

BURGESS ACOUSTI-BOOTH

chines efficiently. Women can produce precision work on them with only a few hours' practice, thus releasing skilled labor for other jobs.

The horizontal and vertical tool blocks operate exactingly in conjunction with each other, and considerable variation is allowed for different types of work. The Machine is recommended for war production and the makers say that prompt deliveries can now be made.

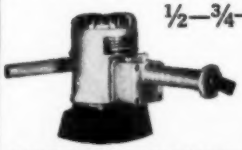
A new catalog illustrating and describing the machine in detail is available.

DARNELL
CASTERS & WHEELS

Save Money. Save Floors. Save Effort. Save Equipment. Save Time and Temper. All these advantages are yours when you install Darnell

DARNELL Corporation, Ltd.
LONG BEACH, CALIFORNIA
16 N. CLINTON ST., CHICAGO, ILL.
40 WALKER ST., NEW YORK N. Y.

CUTS GRINDING COSTS
½—¾—and MORE



HEAVY DUTY
3 Phase
60 Cycle
No Brushes

GASTON POWER TOOLS
2655 W. 95th St., Evergreen Pk. Ill.

THE MIDGET

HALF SIZE

We can supply this Indicator with or without lug on back. Also with support arm for mounting on surface gage. Light weight makes it ideal for use with magnetic base.

Waltham Dial Gage Co
STOW, MASSACHUSETTS

Standard Since 1911

INCLINABLE POWER PRESSES

Write for Literature

L & J PRESS CORP.
Successors to Loshbrough-Jordan Tool & Machine Co.
1625 STERLING AVE. ELKHART, INDIANA

Watthour Meter Protector

For preventing damage due to lightning surge voltages, a new indoor watthour meter protector is announced by Westinghouse.

Known as type A, the unit has a line to ground rating cutoff of 500 volts rms, a 60-cycle gap breakdown of 800 to 1200 volts rms, and a discharge capacity of 20,000 amperes crest. Circuit voltage range is from 110 to 575 volts on 3 phase circuits.

Consisting of an assembly of porous block elements and series gaps, the protector is enclosed in a round aluminum case filled with a non-inflammable compound. The design can be mounted by a conduit through one of the knockouts in a connection box on which the watthour meters are mounted. The nipple on the protector is 1¼" long and is off center to move the protector for clearance if mounted under the connection box.

DUBLIFE

PLUG GAGES LAST TWICE AS LONG AS ORDINARY GAGES

"UPPCO FINISH"

ASSURES EXTREME HARDNESS AND ACCURACY

The handle is made of hexagon material with bronze tapered collet which locks around the plug as it is driven into the handle. The plugs are reversible, so that when one end is worn out the other end may be used, thus giving double life. 30,000 gages in stock ranging from .030" to 1".

Catalog showing DUBLIFE and other gages of American Gage design will be sent on request.

ORIGINATORS and exclusive manufactures of **DUBLIFE GAGES** and **UPPCO FINISH**

UNITED PRECISION PRODUCTS CO.

4618 W. HURON ST., CHICAGO, ILL.

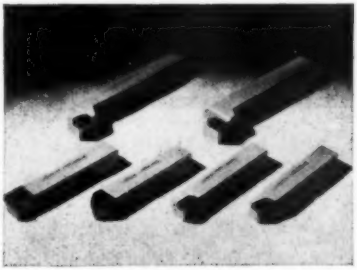
THE BARNES
Motor Driven Precision Cutter Grinding Machine

For precision Grinding Formed Milling Cutters used in the manufacture of rifles, pistols, etc.

General Machinery Corp.
140 Federal St., Boston, Mass.
Telephone Liberty 4826

Carbide Fabricators Issue New Catalog

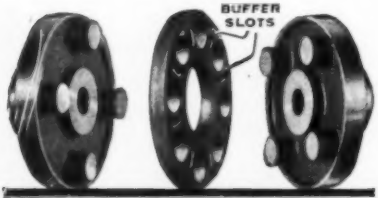
Additions to the line of standard cemented-carbide tools carried in stock, as well as a revised price list on all standard tools, has been announced by Carbide Fabricators, Berkley, Mich., a division of Morse Tool Co., Detroit.



With the complete range of styles and sizes now available, the line now meets almost every need for turning, boring, and facing jobs.

These standard tools—ground ready for use—are supplied promptly from stock. Types are available for roughing and finishing non-ferrous metals, cast iron, bronze, etc. and in steel cutting types for both roughing and finishing. Because of the simplification of the size and price range, orders can be placed by merely specifying the tool number and quantity desired.

Carbide Fabricators are authorized suppliers of Carboloy, Firthite and Vascoloy-Ramet cemented-carbides. A new eight-page catalog listing complete specifications and prices is available.



A MONEY SAVER

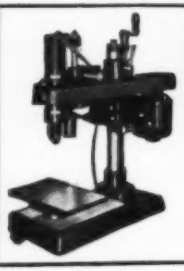
The BUFFER-SLOT COUPLING lengthens the life of your Motor-Driven Machines by absorbing the load shock and constant vibration that gradually wear out machinery and bring on shutdowns and repairs.

BUFFER-SLOT COUPLING

It not only gives you all the advantages of the ordinary Flexible Coupling but it goes a step further and restores that cushion driving torque lost when you discarded Belt Drives. It is long lived, dependable and especially adapted for use with machinery having Ball or Babbitt Bearings.

SEND FOR BULLETIN No. 24-B

BROWN ENGINEERING CO. 126 N. THIRD ST. READING PA.



The HAMILTON MUEHLMATT *Super Sensitive* DRILLING MACHINE

YOUR BEST ALLY

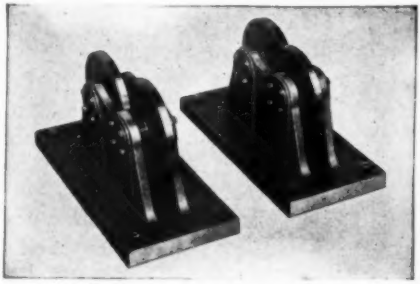
Small drills are hard to replace these days . . . make them last longer . . . save expenses.

USE YOUR HAMILTON MUEHLMATT TO DRILL SMALL HOLES——.004" to .250" diameter.

Get details . . . Write today.

THE HAMILTON TOOL CO.
Ninth and Hanover Streets.
HAMILTON OHIO

It's a Fact Gentlemen,
ANDERSON PILLOW BLOCK BALANCING WAYS do a perfect job



Built in 1000, 2000, 5000, 10,000 and 20,000 capacities

Especially suited for large diameter work, as a sub-base can be made of proper height to give necessary clearance for work.

Anderson Pillow Block Balancing Ways are precision built with chilled iron discs which rotate with minimum friction on sensitive special bearings.

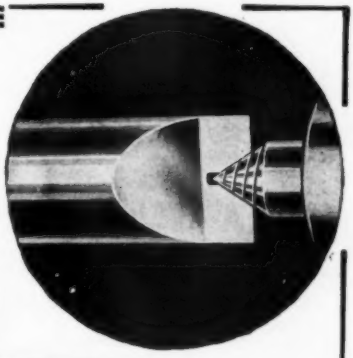
Write for complete details.

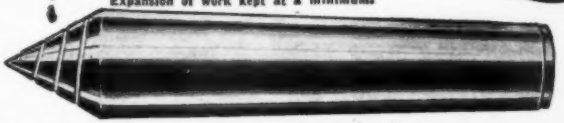
Anderson Bros. Mfg. Co.
1907 Kishwaukee St., Rockford, Ill.

CMD -- HELICAL GROOVE
LATHE CENTER

When used with CMD Lathe Center Point Lubricants has an operating Ratio of from 15 to 1 running time over the conventional TYPE OF LATHE CENTER

CMD Helical groove center expels heat from work caused by cutting tools — conveys center lubricant to extreme point of work and center — Lubricates entire bearing surface of work and center — No stopping of lathe to relubricate the center — No readjustment of tail stock necessary — No dripping or crushing out lubricant — Frictional heats reduced — Expansion of work kept at a minimum.





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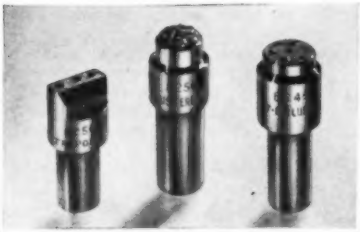
CHICAGO MANUFACTURING AND DISTRIBUTING CO.
1942 W. 46th ST., CHICAGO, ILLINOIS

"KEEP 'EM FLYING"

Buy U. S. Defense Savings Bonds



MEYERS *"Dia-Brasive"*

MULTIPLE DIAMOND POINT DRESSERS

for Efficient, Economical Service

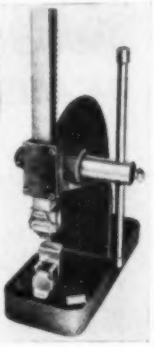
With "Dia-Brasive" Multiple Point Dressers, numerous sharp points are always exposed to the work, or face of wheel. New points can be secured by turning dresser a quarter or half turn. The small diamonds are more reasonable in price, and remain sharp longer, than large stones. We also make a complete line of single point diamond dressing tools. Special dressers built to order.

Write for new literature.

W. F. MEYERS CO., INC.

Dept. BB, BEDFORD, IND., U.S.A.

Hercules Embossing Press



A new arbor press outfit embosses metal name plates, parts, tags, badges and metal checks making a permanent mark that is difficult to duplicate. Embossed numbers guard against counterfeiting of badges, tags or other parts.

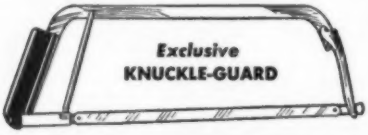
The machine incorporates an upper and a lower Hercules Holder. Type in each holder is quickly interchanged by simple thumb pressure on holding clip. The accurate square ram of the press assures register.

An unusual feature is the mirror finish metal plate back of the female holder that shows a reflected image of each character face, expediting character changing and aiding in matching the male and female characters.

Prompt deliveries can be made to defense plants by Acromark Corp., 259 N. Broad St., Elizabeth, N. J.

Laminated Shim Booklet

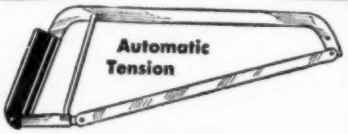
An 8-page booklet giving a history of development of industrial and mechanical applications of laminated shims since founding of the Company, has been issued by Laminated Shim Co., Inc., Glenbrook, Conn. The book describes use of shims for fitting machine parts in original assembly, as well as for making service adjustments.



RAPID COMBINATION SAW

Change from full throat to taper in 30 seconds. Patented handle locks blade tight—change in 2 seconds. All-steel construction—crackle grip handle. 6 Types. Write for complete information.

TWO SAWS in ONE



RAPID MANUFACTURING CO.

Box 488, - - Glendale, California

TO HELP YOU TEACH THE NEW GRINDER HAND

how to get maximum service from your Diamond Tools—we have some effective training material. Send for it. No obligation.

KOEBEL DIAMOND TOOL CO.
9352 Grinnell Ave., Detroit

KOEBELITE
DIAMOND TOOLS

Multi-Point, Multi-Set, Multi-Edge, and Single Set. Diamonds for All Industrial Purposes.

Production STEP UP WITH GROB DIE MAKING MACHINES

"THE TOOLMAKER'S BEST FRIEND"

Unmatchable performance for most difficult sawing and filing of tools and dies. Compact, powerfully built, for rigorous shop service. Faster, more economical in operation.

Write or wire for details and prices.

GROB BROTHERS
GRAFTON WISCONSIN

NOW YOU CAN GET CHALLENGE SEMI-STEEL BENCH PLATES

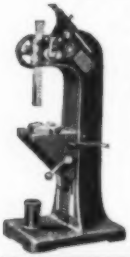
413

...PRECISION GROUND!

These small semi-steel bench plates are now available for many types of work, particularly inspection and assembly of small parts. They provide an accurate surface and are built for lasting strength and rigidity. All four sides are machined at exact right angles to the top. Challenge Precision Ground Bench Plates are made in nine standard sizes, from 8x10 to 18x18 inches. Other sizes to order. Prompt delivery on standard sizes. Write for new illustrated catalog on this and other precision equipment.

Challenge
THE CHALLENGE MACHINERY CO.
GRAND HAVEN, MICHIGAN, U.S.A.

SPEED-UP PRODUCTION
WITH
FAMCO
FOOT AND ARBOR
PRESSES



Production will win the war. Step-up your production and assembly operations requiring percussion and pressure with FAMCO Presses. 40 STOCK SIZES AND MODELS.

PROMPT DELIVERIES
Write for details.

FAMCO MACHINE CO.
1320 18th St., Racine, Wis.

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BUY WHITNEY-JENSEN
METAL-WORKING MACHINERY and HAND TOOLS
for LONG LIFE and ACCURACY

No. 75 DUPLEX
ROLLING MACHINE
CAPACITY: 16 or 18 GA., 38 FPM.

Write for Catalog 14

30 YEARS BUILDING SHEET METAL TOOLS

WHITNEY METAL TOOL COMPANY
105 DORSEY STREET • ROCKFORD, ILLINOIS

Cartridge Cleaning

The important role played by controlled cleaning methods in speeding up cartridge case production is discussed in a 5-page feature article appearing in the Jan.-Feb. issue of Oakite News Service.

Pointing out that effective cleaning-operation control begins with the selection of drawing lubricants which may be easily removed after each draw, the article traces the journey of a cartridge case through production from raw stock to finished product. It discusses such essential operations as pickling and washing after annealing, cleaning before heading, and cleaning after finish machining. Considerable data is also given on the properties required of materials used in this work as well as practical formulas found successful in cartridge case cleaning.

Another article appearing in this issue describes the important part played by proper cleaning of metal parts in facilitating drying and baking with the Infra-red Process.

Copies of this issue may be obtained by writing to Oakite Products, Inc., 57 Thames St., New York City.

Non-Metallic Bearing Catalog

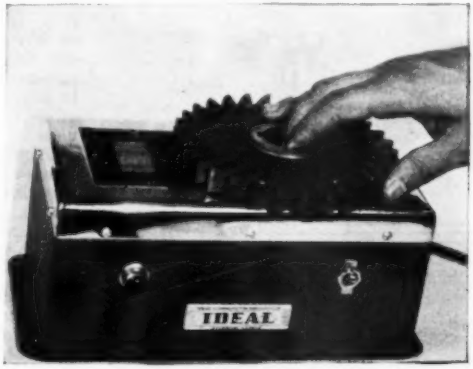
A new bulletin describes Gatke Moulded Fabric Bearings of various types for grease or oil lubrication, water lubrication, acid-resisting service, and some unlubricated applications. Included are operating characteristics of the various types with performance results on typical applications.

Address the Gatke Corp., 228 N. La Salle St., Chicago.

FOR DEFENSE SAKE
DON'T DISCARD YOUR WORN REAMERS.
WE RESTORE THEM TO
ORIGINAL DIAMETERS
ALL STANDARD HIGH SPEED STEEL
REAMERS WITH STRAIGHT FLUTES
DIAMETERS ½ TO 3 INCHES.
THEY WILL REAM MORE HOLES AND
COST LESS THAN NEW ONES
Abrasive Engineering Corp.
Spring Lake, Michigan

Ideal Develops New Demagnetizer

A new, portable Demagnetizer is announced by Ideal Commutator Dresser Co., 1035 Park Ave., Sycamore, Ill.



It quickly demagnetizes tools, drills, punches, dies, and work held in magnetic chucks. Abrasive particles such as metallic dust, flakes, fine chips, etc. that simply can't be wiped off clean with a rag are easily removed after a single pass across the magnetic poles.

After the tool or part is demagnetized, it can be laid on a bench or shelf without again attracting nearby metals.

Large parts may be demagnetized in a similar manner, except that the Demagnetizer, which is light in weight and easy to handle, is moved over the heavy, bulky work.

If tools are not demagnetized, they are bound to attract small and sometimes imperceptible metallic chips and dust. Such abrasive particles, clinging to magnetized cutting edges, rub constantly between tool and work, causing the tool to bind or heat and dull quickly. That's why demagnetized tools stay sharp longer.

The Ideal unit has an indicating light which shows when current is on. Has all metal, streamlined case. Rating:—115 volts, 50-60 cycle (5 amp). Other voltages and frequencies are available. Size only 5-¼x10½x4½". Weight 17 lbs.

NEW LOW COST
DRILL GRINDER

Anyone can do expert drill grinding with this simple-to-use drill grinding attachment—fits on any bench grinder—saves buying new twist drills—saves time and materials that dull bits waste. Grinds bits from 3/16 to 1¼. Write for FREE literature.

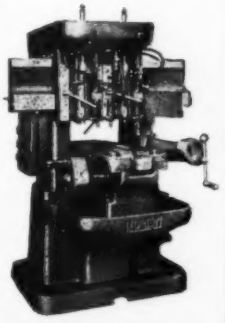
T & H MFG. CO.
811 E. 31 St.
Kansas City, Mo.

"KEEP 'EM FLYING"

MOREY No. 12M *High Speed* Vertical Profiler and Miller

Preloaded precision bearings for spindles

Production of interchangeable parts requiring milling of any contour or outline can be materially speeded up by this Profiling and Milling Machine.



Ask for Circular No. 680-A

Morey Machinery Co., Inc.
410 Broome Street, New York, N. Y.

BUY U. S. DEFENSE SAVINGS BONDS AND STAMPS

Rust Prevention Cream

A new principle of rust prevention is announced by the Milburn Co., Detroit, in the form of a cream known as Ply-Rustex, applied to the worker's hands before contact with highly polished metal surfaces. This is claimed to eliminate perspiration corrosion and other forms of rusting caused by handling of metals during machining and processing operations. In setting-up or removing essential metal parts, a fingerprint may become a source of corrosion. Invisible at the outset, these focal points of rust otherwise may be sealed-in.

With Ply-Rustex, the worker applies cream to his hands before touching any part of article to be machined or processed. This new technique is said to enable free handling of the metal throughout the machining operation without gloves. It forms an invisible film on skin, a protective coating that is inert with respect to chemicals, oils, cutting compounds and other materials that may be a part of the particular industrial process.

According to the makers, Ply-Rustex is non-toxic and harmless to the skin. It is easy to apply, like a vanishing cream, and is removed with equal facility. Forming an impervious protective coating, it helps prevent irritations that may result in many forms of industrial skin disorders or dermatoses.

"KEEP 'EM FLYING"

RELEASE LARGER MACHINES FOR HEAVIER WORK

•

PUT SMALL JOBS ON THIS

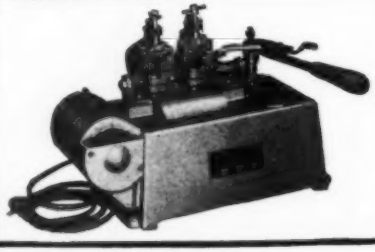
LINLEY

VERTICAL MILLING AND JIG BORING MACHINE

This machine is ideal for tool, die, fixture and pattern work. Is versatile and accurate. Micrometer screw feed quill. Direct reading eliminates pencil figuring and possible errors. Smooth accurate boring is assured to any predetermined depth up to 3".

Write for descriptive Bulletin.

LINLEY BROTHERS CO., 11 MONTAUK ST., BRIDGEPORT, CONN.



BAND SAW WELDERS

The No. 141 Bench Type Metal Working Band Saw Welder is available with or without grinder. Work can be annealed without removing from the Welder. Band saws up to ¾" wide may be welded.

1 KVA—110 Volt—60 Cycle—single phase—5 point heat control—1 point anneal heat—Weight 40 lbs. Let us send you further details.

Mfrs. of complete line of Spot, Butt, Seam, Flash, Projection and Special Welders.

WELDEX INC., 7335 McDONALD AVE., DETROIT, MICH.

First Manufacturer of Adjustable Limit Snap Gages in U. S.

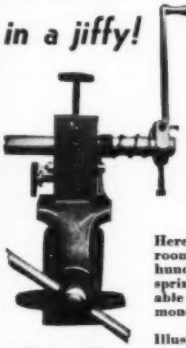
A G D Standard

Plug Gages—Adjustable Limit Snap Gages
Adequate stock ready to grind to special specifications
Priced on Cost—not on Demand

JAS. CLARK
143-17TH AVENUE, PATERSON, N. J.
Successor to
Jas. Clark Jr. Pneumatic Tool Co. and American Gage Co.

MAKE SPRINGS *with* **Blaner Universal Hand SPRING WINDER**

in a jiffy!



Here's a profitable tool room unit. Quickly makes hundreds of sizes of springs. Sturdy, dependable . . . a real time and money-saver.

Illustrated is No. 4 Universal with adjusting shaft of 5/8" square. Takes wire up to 1/4" diam.

Patent No. 2052443

Write for your Circular.

THE JOHN BLANER CO.
Corner Meek & Elm, Sharon, Pa.

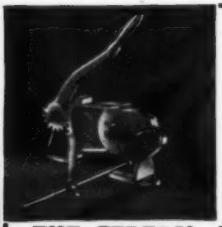
The **CRITERION** Carbide Tool *Grinder*

GREATER PRODUCTION CAPACITY

Provides positive rapid adjustment to meet the rigid requirements of production tool manufacturing. Built for continuous service. Adjustable coolant system. Large work tables instantly adjustable without wrenches or other tools. One-third H.P. balanced precision bearing motor completely enclosed and radially mounted in rubber. Standard equipment: One 60 and one 100 grit 7" dia. steel backed silicon carbide wheels. Ideal for metal bonded or Resinoid bonded diamond wheels.

Order from your dealer or write direct. Request literature. No obligation.

CRITERION MACHINE WORKS
BEVERLY HILLS, CALIFORNIA



★ THE WONDER CUTTER ★

The lowest-priced wire and rod cutter on the market. The hardened cutters last indefinitely. Hand operated. A giant for work, cuts wire and rods up to 5/8-in. round or 5/8-in. square and band iron up to 1/8" by 2-in. Adjustable stop for repeated cuts to same length. Large or small, your shop can use a WONDER CUTTER.

Write today for prices and trial offer.

THE FEDERAL FOUNDRY SUPPLY CO., 4602 EAST 71st STREET CLEVELAND, OHIO

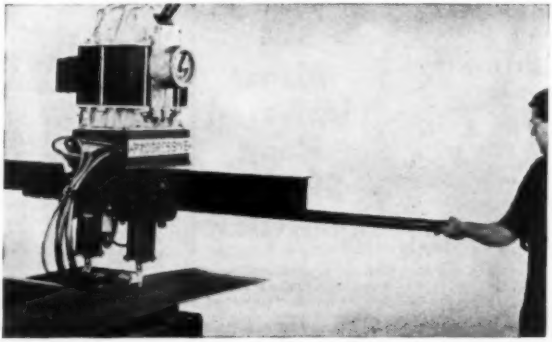
EVANS *High Speed Steel* **REAMERS**

LOOK AT THESE FEATURES

- No honing.
- Will not chatter.
- Chrome-like finish.
- Perfect alignment.
- Full bearing surface.
- Left and right spirals.
- 50 to 80 thousandths expansion.
- Cannot fall in slots or oil grooves.
- Extension pilots for line-up work.

WILL SHIP ON 30 DAY'S TRIAL | **EVANS FLEXIBLE REAMER CO.** Ravenswood & Wilson Ave., Chicago, Ill. | WRITE FOR CIRCULAR

Low Cost Strip Welder



An ingenious and low cost installation for welding together ends of strips has recently been developed by Progressive Welder Company, 3019 E. Outer Drive, Detroit, Mich. Shown in the illustration, it consists of two simple air operated series connected guns for spot welding, a notched bar to locate welds, and a control handle to move the gun along, the entire assembly being supported from an I-beam section above which is located the welding transformer. To weld strips together, the operator moves the gun to the first notch. This trips a switch, causing welds to be made. The gun is pulled along to the second notch, causing another pair of welds to be made, etc., for as many welds as are needed for the specific strip width. A button is provided on the control handle to prevent closing of the welding circuit when gun is returned to starting position.

USE ECONOMY — DERIVE ECONOMY

SOCKET HEAD CAP SCREWS

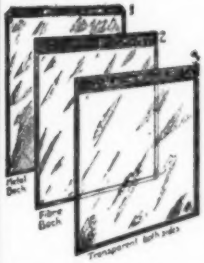
MILLED FROM BAR

HOLLOW SET SCREWS

MADE OF ALLOY STEEL

ECONOMY MACHINE PRODUCTS CO., 5207 Lawrence Ave., Chicago, Ill.

Protect **Shop Orders, Drawings, Blueprints...**



with

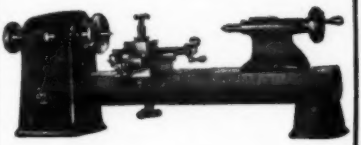
WADE Shop Envelopes

Any size or style to order, stiff or flexible, to suit your requirements.

Send for folder and quotation.

WADE INSTRUMENT CO.
1422 E. 109th St., *Cedar 4728,* Cleveland, O.

AMES BENCH LATHES

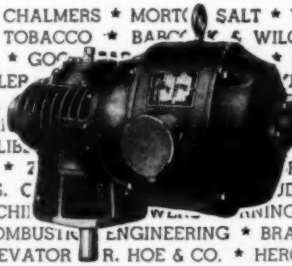


Precision lathes for doing most accurate turning, drilling, milling, threading, filing, polishing, in the tool room or in production.

Send for Complete Information

B. C. AMES COMPANY
WALTHAM, MASS.

ALUMINUM CO. * ALLIS CHALMERS * MORT[illegible] SALT * WARD LEONARD * CUTLER HAMMER * REYNOLDS TOBACCO * BA[illegible] & WILCOX * REMINGTON ARMS STUDEBAKER * DUPONT * GO[illegible] * NEW DEPARTURE * HYATT TOLEDO SCALE * KOHLER [illegible] FORD ARSENAL * DELCO-REMY * DE LAVAL, LTD. [illegible] VIATION * AGFA ANSCO HAYS CORP. * WESTERI[illegible] CTRIC * GENERAL REGULATOR * U. S. NAVY * LIB[illegible] SPARK PLUG * ELECTRIC AUTOLITE * LINK-BELT * 7[illegible] R & SCHWARTZ * OWENS ILLINOIS GLASS * U. S. C[illegible] JDD * LEEDS & NORTHRUP BARRY WEHMILLER MACHI[illegible] NING FIBERGLAS * CAMERON CAN MACHINE CO. * COMBUSTI[illegible] ENGINEERING * BRASSERT & CO. * CREAMERY PACKAGE * ENERGY ELEVATOR [illegible] R. HOE & CO. * HERCULES POWDER * HEYDON



LARGE and SMALL THEY all INSTALL

FURNACE * MATHEWS CONVEYOR * AMERICAN OPTICAL * FOOTE-BURTE MACHINE CO. * INTERNATIONAL SILVER * STEARNS ROGERS * STACKPOLE CARBON RUSTLESS \MERICAN VISCOSE * **Janette Speed Reducers** AVIATION' PHOTO ELECTRIC PILOT * NATIONAL CARBON CO. * OLSON RUG CO. * SCHULZE BAKING CO. * INTERNATIONAL FILTER CO. * PACKARD MOTOR * VULTEE AIRCRAFT

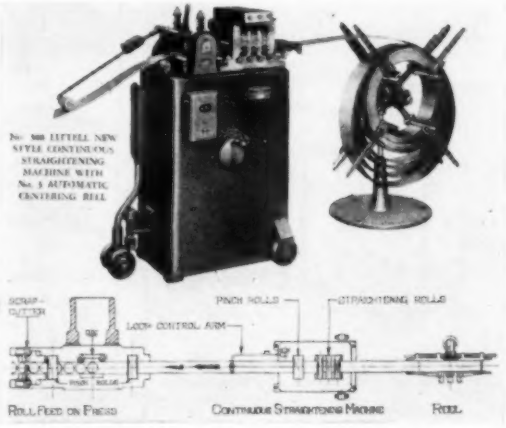
Janette Manufacturing Company
556-558 West Monroe Street Chicago, Ill. U. S. A.

Littell Offers New Feeding and Straightening Machine

A new style continuous Feeding and Straightening Machine is announced by F. J. Littell Machine Co., 4153 Ravenswood Ave., Chicago.

Machine is mounted on a fully enclosed fabricated steel base, is portable and equipped with a control arm for stopping and starting motor to regulate the loop of stock between feed and press.

Unit is so arranged that either 5 or 7-roll straightener can be used. The straighteners are built with all rolls ball bearing or with lower rolls power driven. The type of straightener furnished depends on the maximum width and maximum thickness of stock to be straightened.



Specifications include pinch rolls 3½" diameter x 8½" long, for handling stock up to 8" wide. Unit is driven by a ¾ hp 3-phase, 1725 rpm, 60-cycle, 220/440-volt motor through a 6-to-1 variable-speed transmission. Standard speed is 10 to 60 feet per minute. Distance from stock line to floor is 40". Floor space required is 17x36". Shipping weight is approximately 800 lbs.

Hobart Announces New Publication

An arc welding news magazine "Hobart Arc Welding News" is now being published by Hobart Brothers Co.—Troy, Ohio. This interesting publication will be sent free of charge to anyone writing the company's Direct Mail department and asking to be placed on the regular magazine mailing list. Editorial matter is made up from entries in the Hobart Arc Welding News Contest; letters to the editor; and articles by welding experts.

METAL DUPLICATING WITHOUT DIES!

DI-ACRO "DIE ACCURACY WITHOUT DIES" PRECISION MACHINES

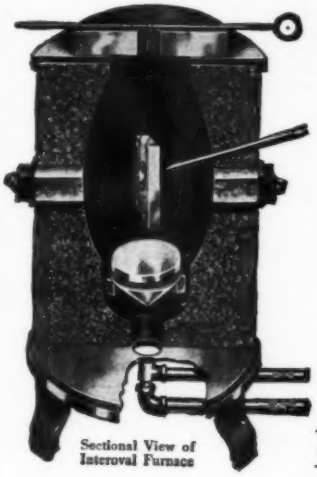
You can make many metal parts to die accuracy and save time and die costs with "DI-ACRO" Precision Machines, — Bender, Brake, Shear.

DI-ACRO BENDER NO. 1 Forms intricate shapes from Angles - Channels - Rod - Round or Square Tube - Round, Half-Round, Square or Flat Wire - Strip stock. TWO-WAY operation.

DI-ACRO SHEAR NO. 1 Trims duplicated stampings, shears stock sheets, cuts strips, squares up stampings, makes slits or notches. Shearing width 6". ALL DI-ACRO machines are accurate to .001".

Send for Catalog "Metal Duplicating Without Dies"

O'NEIL - IRWIN MFG. CO., 314 — 8th Ave. S., Minneapolis, Minn.



Sectional View of Interoval Furnace

INTEROVAL HEAT TREATING FURNACES

- WIRE SUSPENSION. Pieces are suspended by means of a wire attached, and heated entirely by radiation.
- HEATING CHAMBER of cylindrical oval shape, so that products of combustion do not contact pieces being treated.
- DEFLECTOR at base deflects flame upward, close to concave walls, and releases them through upper opening. The flame seals the top against entrance of air, yet enables operator to make observations.
- PYROMETER placed so fire end is closest to piece being treated, providing accurate determination of work temperatures.

For detailed information concerning this furnace write for folder.

Bennett INSURED STEEL TREATING CO.

130 SOUTH ST. — NEWARK, N. J.

BURR KEYSEATERS

Mill keyways in the run or on the ends of shafting already erected—save money on alteration, erection, and repair work.

Made in 4 sizes, for hand or motor operation.

Write for Bulletins and prices.

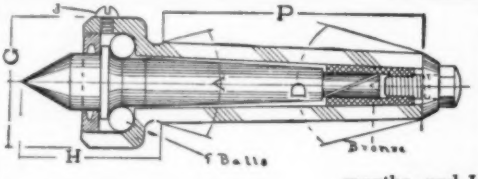
JOHN T. BURR & SON
429 Kent Ave., Brooklyn, N. Y.

SPEED-UP
YOUR RIVETING OPERATIONS

A great help in Defense Production, these **Grant** Riveters are available in Noiseless Spinning and Vibrating Hammer types, also Vertical and Horizontal Multiple Spindle Spinning Machines. *Information? Write!*

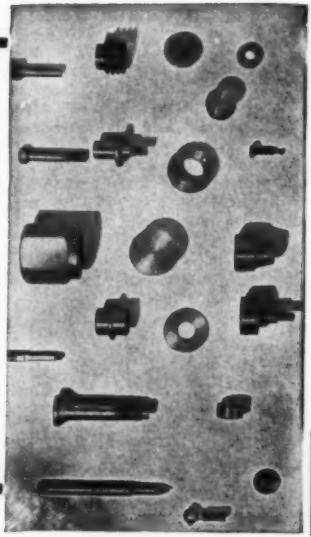
THE GRANT MFG. & MACHINE CO.
C. E. Station, Bridgeport, Conn.

TOUGH STEEL—For steel that cuts steel, Westinghouse metallurgists have substituted a new tough alloy that contains molybdenum in place of priority-bound tungsten. The United States produces about 90 per cent of the world's molybdenum, while this country must depend on China and Burma for much of its tungsten. A molybdenum steel-tipped cutting tool is shown shaving a layer of steel from the edge of a large ring of steel to shape a part for an electric generator. Clamped in the jaws of the boring mill, the tool shaves off steel as the ring-shaped piece rotates on a motor-driven turntable. Similar tools are used to shape many other parts of electric generators and motors at the East Pittsburgh works. Engineers predict this substitution of molybdenum for tungsten will be permanent, since the new tool steel appears to be as good as the old one and is less expensive.



Solicited Shop Foreman said: "I like your Live Center, but I cannot buy. But if you put one on that Crank Shaft Lathe, and it stands up for 30 days, I will see that you are paid for it". I did so, and it stood up for 29 months, and I got pay for several doz.

RIGID TOOL CO., 2000 Witherell St., Detroit, Michigan



RITCO

SCREW MACHINE PRODUCTS

Capacity in all materials: multiple spindle to 2⅝"; single spindle to 4¼". Accurate, dependable.

We also offer facilities for

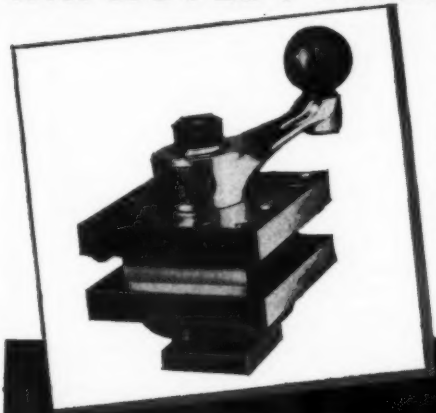
DIE SINKING and DROP FORGINGS
BOLTS, NUTS and STUDS
HEAT TREATING

Estimates gladly submitted
Send samples or blueprints.

Catalog on request.

RHODE ISLAND TOOL CO.
148 West River St., Providence, Rhode Island
Serving American Industry Since 1834

IMPROVED! Mastercraft Turret Tool Post



Always A Superior Tool
...Now Greatly Improved

Faster action for top production — Hardened throughout, for longer service — Self compensating for wear in hard use — Precision built for accuracy.

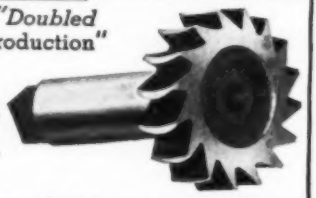
The new Mastercraft Turret is a fast indexing 4-way tool post for repeat operations on the engine lathe or for front cross slide on the screw machine. Especially designed for use on 9" and 10" South Bend Lathes, Sheldon, Clausing, Atlas, Logan and similar bench lathes and small screw machines.

Order through your jobber or write for literature.

MASTERCRAFT TOOLS

F & M SALES CO. • Hollywood, California
Manufacturers and Selling Agents

The *New* Aber
Curved Tooth
WOODRUFF KEYWAY CUTTER
"Doubled Production"
according to reports.



Many advantages over old-type keyway cutters:

More cutting edge — Gives shearing cut
Cuts 50% faster — Easy to sharpen
More cuts per sharpening

Full line standard sizes, round or square end shank, in stock. Special size cutters made to order. Territories available.

Circular with prices, on request.

ABER ENGINEERING WORKS, INC.
WATERFORD, WISCONSIN

BURKE
MILLING MACHINES
Make Fast Work of Small Jobs

Motor Driven

Timken roller or ball bearings to spindle

Write today for circulars

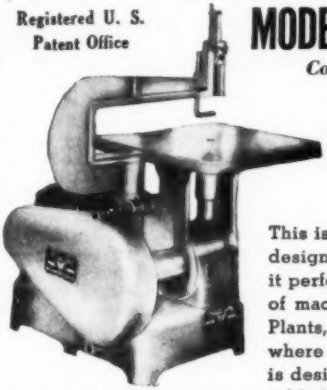
Burke Machine Tool Co.
297 E. 16th St., Conneaut, Ohio

Schrader Pneumatic Pedal

A recent study of operators using power presses in a large plant is said to have revealed that an average day called for 10,000 trips of a 4" stroke mechanical pedal. The operator had a fatigue strain clear up through the hips to the shoulder, from standing on one foot while the other travels 7,777 feet—equivalent to hopping 1½ miles on one foot.

To help overcome this physical waste, the Schrader Pneumatic Pedal was developed by A Schrader Sons, 470 Vanderbilt Ave., Brooklyn, N. Y., cutting the effort to a 1½" stroke without lifting foot from the floor. In addition, pedal can be operated with either foot. Since it is portable, it permits various angles of approach, and by offering remote control, it eliminates many unnecessary steps and motions.

Registered U. S. Patent Office



MODEL NO. 16 "SPECIAL"

Constructed as per Specifications of U. S. Naval Aircraft Factories.

BUTTERFLY FILING and SAWING MACHINE

(Die Making Machine)

This is a very heavy, powerful machine and is designed for extra heavy filing and sawing, but it performs small work just as well. This type of machine is usually adopted in Ammunition Plants, Airplane Factories and machine shops where heavy and precision filing and sawing is desired. We also manufacture smaller models –Model D-10" Table; Model No. L-12" Table.

Beware of Imitations!
Our machine carries the Butterfly trade mark.

HARVEY MANUFACTURING CORP.

161 GRAND ST., **Phone CAnal 6-5170** **NEW YORK**

Blade Breakage Stopped Production Insured

BY INSTALLING

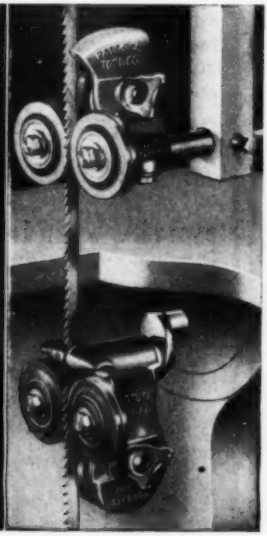
PADDOCK Ball Bearing BAND SAW GUIDES

Recommended for New and Old Machines cutting all material at any speed.

SENT ON 10 DAYS' TRIAL

The use of Paddock Ball Bearing Guides increases the efficiency of the machines so that more and better work can be done. The hazard of operation is reduced. Most of the blade breakage is eliminated. Wheels are interchanged—in effect, three sets of guides in one.

Write for details today and list of prominent manufacturers using Paddock Guides.

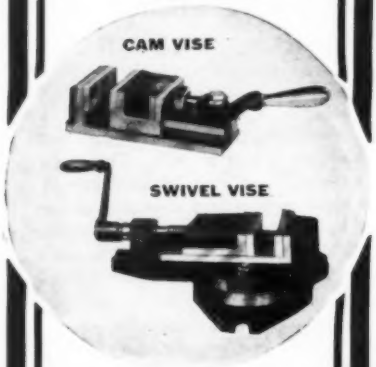


PADDOCK TOOL COMPANY

Guide Makers Since 1920

1418 Walnut St., **Kansas City, Mo.**

"MODERN" VISES



"MODERN" VISES are precision-built with hardened and ground jaws for rapid production work on milling machines, shapers and drill presses.

CAM VISES—Jaw Dimensions: width 4" or 5", depth 1½", maximum openings 2" or 3".

SWIVEL VISES—Jaw Dimensions: width 4", depth 1½", maximum opening 3". Can be used without base.

Write for folders.

MODERN TOOLS,
EAST BERLIN CONN.

Manufacturers of precision high speed steel and carbide cutting tools.

Steel Stamp Catalog

A new 8 page descriptive catalog is available from New Method Steel Stamps, Inc., 149 Jos. Campau, Detroit, summarizing the more important styles and varieties of marking equipment offered by this company and giving technical information to assist users.

Marking devices are included for both machine and hand marking. The machine devices include roll and graduation markers for mounting in lathes and screw machines, and markers for flat surfaces for use in presses, etc. A broad line of hand markers of all types is described, including those for round surfaces, shaft ends, etc. Both types are available with either permanent or interchangeable characters.

A new line of inspector's stamps is also illustrated and includes two unusual series wherein the borders form the individual identifying characteristic in addition to center numerals or letters. Approximately 100 different conventional symbol type stamp designs are shown, as well as numerous numeral and alphabetical designs, and script letter styles. Hand hammers incorporating single interchangeable stamps are a new item.

In addition to various types of stamps, dies for embossing trade marks, monograms, emblems, badges and name plates as made to individual specifications are illustrated. Facilities of the company to handle a limited amount of special high-precision profiling work and the manufacture of accurately calibrated rings, collars and discs, serrated parts, etc., are described, and samples are shown.

JFS - CUB
VARIABLE SPEED TRANSMISSION

For "A" section V-belts—3.3—1 speed range—perfect belt alignment in all positions. Priced so low that no shop or machine need go without infinite speed selection. *See your dealer or write* $16.50

Standard Transmission Equipment Co.
Dept. HC. 416 W. 8th St. Los Angeles, Calif.

A WAR MESSAGE
to
ALL EMPLOYERS

★ **From the United States Treasury Department** ★

WINNING THIS WAR is going to take the mightiest effort America has ever made—in men, materials, and money!

An important part of the billions of dollars required to produce the planes, tanks, ships, and guns our Army and Navy need must come from the sale of Defense Bonds. Only by regular pay-day by pay-day investment of the American people can this be done.

Facing these facts, your Government needs, urgently, your cooperation with your employees in *immediately* enrolling them in

A PAY-ROLL SAVINGS PLAN

The voluntary Pay-Roll Savings Plan (approved by organized labor) provides for regular purchases by your employees of Defense Bonds through voluntary pay-roll allotments. All you do is hold the total funds authorized from pay-roll allotments in a separate account and deliver a Defense Bond to the employee each time his allotments accumulate to an amount sufficient to purchase a Bond.

You are under no obligation, other than your own interest in the future of your country, to install the Plan after you and your employees have given it consideration.

WHAT THE PAY-ROLL SAVINGS PLAN DOES

1. It provides immediate cash now to produce the finest, deadliest fighting equipment an Army and Navy ever needed to win. **2.** It gives every American wage earner the opportunity for financial participation in National Defense. **3.** By storing up wages, it will reduce the current demand for consumer goods while they are scarce, thus retarding inflation. **4.** It reduces the percentage of Defense financing that must be placed with banks, thus putting our emergency financing on a sounder basis. **5.** It builds a reserve buying power for the post-war purchase of civilian goods to keep our factories running after the war. **6.** It helps your employees provide for their future.

To get full facts on installing the
Pay-Roll Savings Plan, write TODAY to:
Treasury Department, Section B,
709 12th Street, NW.,
Washington, D. C.

U. S. Defense BONDS ★ STAMPS

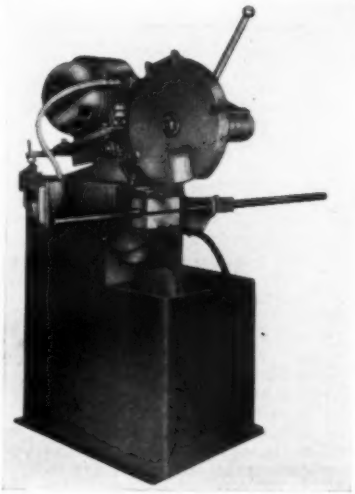
Pines Semi-Automatic Saws

Pines Engineering Co., 123 Main St., Batavia, Ill. has developed a new semi-automatic cut-off saw for cutting steel and non-ferrous metals up to 3". It was developed especially to cut shell bands held to length with end limits of plus or minus .0005", and can be used with either high speed steel blades or abrasive wheels.

It is equipped with a cam action chuck to avoid slippage or rotation while saw is passing through piece. The chucking, it is said, is done automatically and rapidly as soon as the saw starts to move.

The machine can be equipped with an automatic drive for oscillating the saw, imparting a harmonic motion to the saw carriage, producing a slow speed through the wall of the tube on each side, and increasing the speed through the center of the tube. It also provides for a quick return motion of the saw, the stroke of which is adjustable for different work diameters.

Drive is equipped with free wheeling type clutch allowing for continous operation, or for one complete cycle of the saw. Maximum capacity of the machine is 1800 pieces per hour, according to the makers.



You Need These TIME SAVERS to Speed-Up All-Out Production

TYPE A—STEP JAW DESIGN

Size	Range Bores Taken	Net Price
1A	½" to 1"	$12.00
2A	1" to 1½"	16.00
3A	1½" to 2"	23.00
4A	2" to 3"	34.00
5A	3" to 4"	40.00

NICHOLSON EXPANDING MANDRELS SLIDING JAW AND TAPERED SLOT TYPE

TYPE B—STRAIGHT JAW DESIGN

Size	Range Bores Taken	Net Price
1X	½" to 9/16"	$10.00
2X	9/16" to 21/32"	11.00
3X	21/32" to ¾"	12.00
00	¾" to ⅞"	14.00
0	⅞" to 1"	16.00
1	1" to 1¼"	18.00
2	1¼" to 1-9/16"	21.00
3	1-9/16" to 2"	29.00
4	2" to 2½"	40.00

Economy tools for holding work while being machined between centers on lathes, grinders, millers, shapers, etc. Made of tool steel, hardened and accurately ground. Both types sold singly or in sets.

Prompt delivery on sizes shown as well as larger sizes taking up to 7". Clip ad to your letterhead for bulletin. (Prices subject to change.)

W. H. NICHOLSON & CO., 117 OREGON ST., WILKES-BARRE, PA.

DB Die Cushion

The Dayton Rogers Mfg. Co., 2830 13th Ave., S., Minneapolis, Minn., announces a new Model DB Universal Pneumatic Die Cushion adaptable to a large number of press operation where cushioning means is required for drawing and forming operations.

According to the makers, it readily replaces springs and rubbers commonly used on forming and drawing dies and is a complete, self-contained unit that automatically maintains a predetermined cushioning pressure on either draw ring or pressure pad at all times This pressure pad control is made possible by a combination regulator and gauge furnished with each installation and makes fullest use of operator's skill in production of drawn and formed parts. A record is kept of pressure by means of pressure gauge and on future setups this working pressure may be quickly duplicated.

Each cushion can be supplied with a special pin pressure pad to take advantage of the entire pin area available in connection with maximum press

bed opening. The Pneumatic Die Cushion can be mounted to bolster plate by drilling and tapping 4 holes for mounting studs. Lubricating of cushion units is done from front of cushion cylinder. They are now made in sizes from 6 to 20", having a maximum drawing capacity of 10", and having ring holding pressures up to and including 15 tons. No surge tanks are necessary for standard drawing operations.

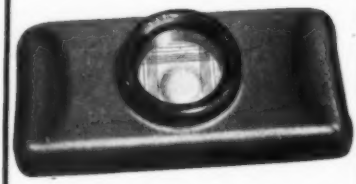
GEAR
GUARDS
Don't delay your production of machines due to lack of facilities to make Gear Guards. Littleford has a department for making these Gear Guards and can furnish them with speed and at a low cost. Send blueprints for prices today.
LITTLEFORD
LITTLEFORD BROS., INC.
451 E. Pearl St.
Cincinnati, Ohio

MULTI-PURPOSE
TURNBUCKLE

An extremely handy 3" Turnbuckle or Swivel Screw; in constant use by the Navy and invaluable in shipyards throughout the country.

DE BOER MFG CO.
SYRACUSE, N. Y.

FELL PRECISION LEVEL



A precision "all-way" level for use in machine tool building, setting up and maintenance, whether for establishment of level working surfaces or for the accurate checking of straightness where true level itself is not required.

Graduations are in .0005" per foot and form squares about a circular bubble, thus giving coordinate readings and showing the direction and amount of slope, if any. Made in two sizes—5½"x12"; 3½"x6".

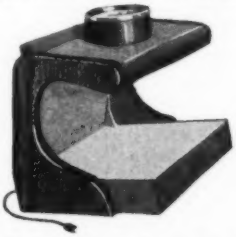
Write TODAY for bulletin giving full details.

Wm. B. FELL COMPANY
700 South St. Rockford, Ill.

Magnifier & Inspector

A simple, handy device of obvious utility for inspecting finished work and many other similar shop uses is the Inspectograph, made by Schultz & Anderson Co., 174 Ferry St., Newark, N. J.

It is provided with a 4" lens. Confusing glare, reflections and shadows are eliminated by its sides (see cut below). Fluorescent lighting within the device provides a soft cool light.



According to the makers, some of its principal uses are for finding cracks and scratches, working on small punches, inspecting various surfaces, reading micrometers accurately, and inspecting screw machine products, gun parts, gauges, taps, castings, etc.

Trans-Ceiver Booklet

This 4 lb., combination ultra short-wave, self-contained transmitter and receiver is described in a leaflet available from Communications Division, Weltronic Corp., 3080 E. Outer Drive, Detroit, Mich.

This lightweight, battery-powered Trans-Ceiver has a range of a mile on land and up to five miles where there are no obstructions.

CARBIDE TOOLS

HAVE FAR BETTER FINISHES WHEN FINISHED OR LAPPED WITH
Stadoil DIAMOND LAPPING OIL — The Genuine
Greater Wheel production and life — SAVES TOOLS AND WHEELS
A GREAT SPEED UP ITEM — Widely used and recommended to Industry.

Order thru your supply jobber, if not available locally send your order to us.
SAMPLES? Gladly — write on your letterhead.

STADOIL MANUFACTURING COMPANY
617 S. Beacon St., Dallas, Texas
3221 S. Figueroa St., Los Angeles, Cal.

Arc Welding Movies

Further evidence of the way industry is rallying to supply needs of the War effort is the new Hollywood produced all-color training picture "Inside of Arc Welding."

This film is designed to speed up training of the thousands of apprentice welders required for the building of ships, planes, tanks, and other armaments.

Because of its content of heretofore unphotographed phenomena, the film will be of unusual interest to experienced, as well as apprentice welders. It illustrates the techniques of arc control and electrode manipulation, and actually shows what goes on inside the electric arc.

Filming of this subject was accomplished with great difficulty by the application of new lighting methods which permitted the camera to pick up the entire welding process. Lighting experts heretofore have claimed it would be impossible to picture the operation of the electric arc, which is one of the most brilliant light sources known, developing a temperature exceeding 7,000 F. As a matter of fact, the operation is never really seen by welders who are actually working with it, and the film will enable welders actually to follow work for the first time in detail.

Complete information may be obtained by writing Raphael G. Wolff Studios, 1714 North Wilton Place, Hollywood, Cal.

ELIMINATE HAND REAMING WITH THIS POWER REAMER

Power Reaming at its best. Saves time and money. Improves your work. Speeds up removal of burrs from tubing as well as from bores after keyseating or drilling of set screw holes. The Catskill also saves on finish reaming, countersinking and counterboring, smoothing off and chamfering sharp edges of round bar stock and many other finishing jobs.

Write for details.

CATSKILL METAL WORKS

CATSKILL, NEW YORK

LOW TEMPERATURE WELDING

NEW METHOD REVOLUTIONIZES WELDING

CASTOLIN EUTECTIC ALLOYS

Salvage defective castings . . . . save "hard-to-get" parts . . . . speed-up production . . . . with this new welding development.

CASTOLIN binds without melting the base metal. This means high strength, matching color. It means less stresses, less warping, less preheating.

WELDS: Cast Iron, Iron, Nickel, Steel, Aluminum, Bronze, Copper, Brass, Magnesium, etc.

EUTECTIC WELDING ALLOYS, INC.

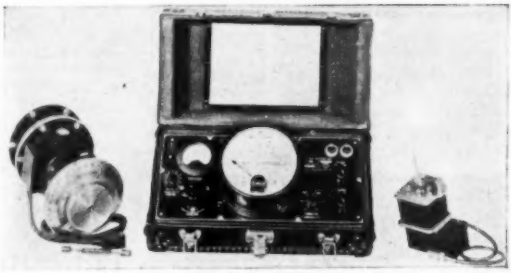
40 Worth Street, New York, N. Y.

WRITE TODAY

Learn about Welding's Greatest Achievement Write on firm letterhead for 32-page book on "Low Temperature Welding".

Portable Dynamic Balancing Unit

To reduce harmful vibration and undesirable noise in rotating machines assembled by mass production methods, a new portable dynamic balancing unit is announced by Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.



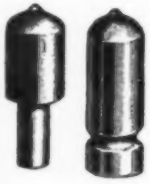
Known as Type HQ, the balancing unit consists of a sensitive wattmeter assembly, a sine wave generator, a velocity type vibration pickup and necessary connecting cords. The apparatus may be used over a speed range of from 600 to 10,000 rpm and by an auxiliary attachment, the range may be extended down to 100 rpm.

The pickup produces a voltage whose amplitude is proportional to the vibration being measured and has a fixed phase angle relationship with the vibration for a fixed frequency. The sine wave generator produces an adjustable phase sine wave current supply whose frequency coincides with the rpm of the machine being balanced. Its field is a two-pole rotating magnet directly coupled to the machine rotor. The stator, adjustable angularly by hand, has two windings 90° apart electrically that facilitate angle and amount observation. Metering unit consists essentially of a specially designed double scale, highly damped dynamometer type wattmeter, calibrated in arbitrary units.

To balance a rotating machine the two-pole sine wave movable-stator generator is coupled to the shaft of the rotor to be balanced. The pickup is held against some part of the frame and produces a voltage whose amplitude is proportional to the vibration to be measured. The voltage generated in the pickup coil varies directly as the frequency and amplitude of the vibrations being measured. Amplitude and vibration phase angle are indicated on the wattmeter.

Grinding Wheel Safety

A new primer on grinding wheel safety has just been issued by the Norton Co., Worcester, Mass. It is a handy pocket size 28 page booklet illustrated in cartoon style that puts over all of the important points with an element of humor and in a way that will not be forgotten. Another valuable feature of the booklet is a table of safe speeds for wheels of different types and diameters.



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KARELSEN'S DIAMONDS KEEP THE WHEELS OF INDUSTRY TRUE

DIAMOND POINTED EMERY WHEEL DRESSERS

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CARBIDE TOOL GRINDER

Removes metal fast when rough grinding.

•

Finish grinds smooth, keen cutting edges.

•

Oversize 7" wheels give greatly increased wheel life.

•

This grinder will quickly pay for itself by increased tool performance and life between grinds.

MODEL AA

Write for details of this and other carbide grinders

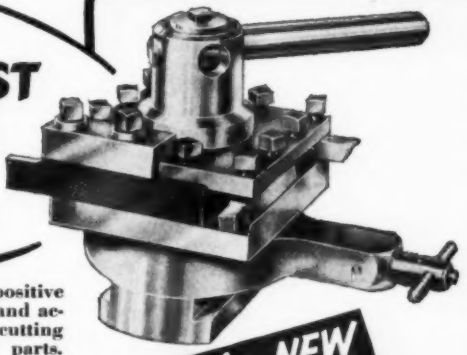
THOMAS PROSSER & SON

120 WALL STREET • NEW YORK

This

TOOL POST TURRET

Will Pay For Itself Quickly



Check these features—positive locking device—quickly and accurately indexed—has cutting off tool-hardened steel parts. To save time and money have a Colwell Turret on the job.

Send for new folder, gives sizes and specifications.

Send for NEW FOLDER

S. G. COLWELL 25 Congress Ave. Prov. R. I.

Plants for Sub-Contract Work

SUPPLEMENTING the lists recently published in this original and exclusive BLUE BOOK service, here are some additional plants available for sub-contract work.

Address all communications to Defense Sub-Contract Dept., Hitchcock Publishing Co., 508 South Dearborn St., Chicago, Ill. (Phone—HARrison 6040). There are no charges or obligations. This is a gratuitous service contributed by The BLUE BOOK to help speed our American All-Out Victory Program:

H-16—New Jersey plant—unusually well equipped for sub-contracting in connection with defense parts made of stainless steel and aluminum; particularly where fine, close tolerance machining must be combined with expert shaping and welding of attached sheet metal parts. Have available, besides the usual machine tools, such special equipment as Taylor-Winfield controlled seam and spot welder, numerous types of arc welders, 400-ton hydraulic press, salt bath outfit, riveting equipment, large power brake and press, 12 ft. shears, etc. This company is desirous of taking on considerable defense work, in addition to its usual line of food machine building.

H-17—New York electrical plant has a metal parts department for which they desire some additional sub-contract work. They are in position to handle small metal parts and assemblies as well as the assembly of electronic devices. While machines, of course, are essential, man power, is just as important. This plant for the past few years built up a corps of graduate engineers, who can intelligently handle a problem starting with the actual tools, and going through the final assembly. Equipment includes B & S Surface grinder; Seneca Falls 14" lathes; power presses; 14" power saw; Doall V16 contour saw; filing machine; 20" folding brake; 36" squaring shear; 4 foot presses; 5 drill presses; spot welder; tapping press; 16" shaper; grinding head; annealing oven; winding machines; impregnating, baking, potting and test equipment; jigs, dies and fixtures.

H-18—Old established Manufacturer, capable of doing high class close work offers the following equipment: 4 Monarch geared head Engine Lathes, size 14" to 18". Also 8 other Miscl. Engine Lathes, 11 Warner & Swasey Turret Lathes, ranging from 1A to 5, including one good No. 4A, 7 Cincinnati Mills, 1 J. N. Lapointe No. 3L Hydraulic Broach, 3 Lucas Horizontal Boring Mills, 2 Giddings & Lewis Horizontal Boring Mill, 1 Gisholt Vertical Boring Mill, 3 Gould & Ebhardt Shapers, 1 Plain Hydraulic Landis Grinder, 2 Cincinnati Grinders, 1 No. 75A Heald Internal Grinder, 1 Barber Colman No. 12 Hobbing Machine, 1 Lees Bradner No. 5 Universal Hobber, 1 Gould & Eberhardt No. 36-B Miller, 1 Gleason 12" Bevel Gear Generator, also complete Wood working equipment, welding equipment, and tin shop equipment. Employs approximately 200 men, will work three shifts if work available.

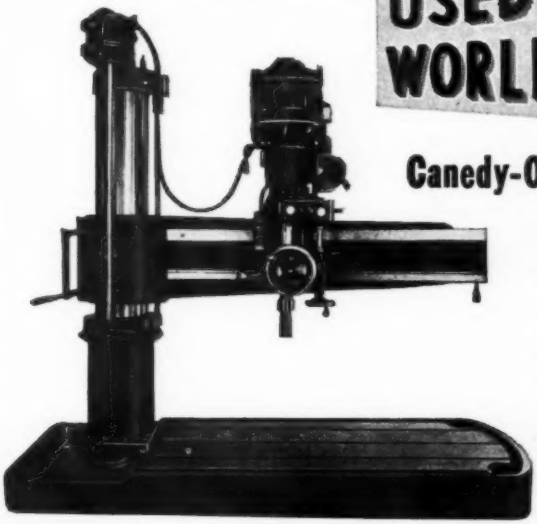
H-14. ..A Chicago precision tool manufacturer has facilities for additional sub-contract work on extra shifts. Well equipped for precision gear cutting on small spur and helical gears. Also Ex-Cell-O diamond boring and small milling machine work. Broaching and precision grinding equipment is also available. Already handling considerable precision work for aviation companies. Throughly modern plant with adequate engineering supervision. Mechanical equipment is high class and less than three years' old.

BR—A substantial plant in Michigan now making heavy machinery. Nationally known and largest in its field. 300 employees. Good staff. Open shop. Now completing a precision ordnance job and seeks further war work. Has a very complete list of machines, virtually all new and including seven large engine lathes, 12 production turret lathes (J & L, W & S and Gisholts), many milling machines, shapers, drills, etc. Has one 2½" horizontal bore, 2 vertical boring machines, 2 small planers, 1 jig borer. Along with all of this is a complete flame cutting and welding department, one each of external, internal and surface grinders and a host of miscellaneous machines.

BQ—A long-established, thoroughly skilled job machine shop. Well supervised. Occupies several floors in own building. Known for ability to do tough jobs. Have 5 engine lathes (from 24" to 60" swing); 2 boring mills (10" vertical and 4" horizontal); 3 planers of medium size; 2 radial drills, 3 milling machines, 1 precision B & S grinder, miscellaneous machines such as shapers, drills, arbor presses, small lathes, small milling machines. Open shop.

BT—A small but expert die and tool shop in Chicago having facilities such as internal and external grinders, shaper, 8 drill presses, jig borer, lathes, millers, 4 surface grinders and all necessary instruments for checking and testing. Open shop. Just now changing over to war work. Seeking subcontract business.

BV—One of the best job plants of its kind in middlewest. Specialize in thread milling, internal, external and surface grinding. Unusually well equipped for precision gear work. Open shop. Good management. New plant.



USED THE WORLD OVER

Canedy-Otto Radial Drill

Canedy-Otto has been the manufacturer of first-class, high-grade drilling units since 1892. These units are available in single spindle, multiple spindle and radial.

We can help you solve your drilling problems. Send for information on our complete line

Early delivery possible.

SPECIFICATIONS:

	9" Column 3' Arm	11" Column 4' Arm	11" Column 5' Arm
Drills to the center of circle on base or table	73½"	96"	120"
Length of arm	3'	4'	5'
Greatest distance from spindle to base	43¾"	48"	46"
Minimum distance from spindle to base	9½"	15"	17"
Minimum distance from spindle to column	10¾"	10"	10"
Traverse of spindle	9½"	9½"	9½"
Hole in spindle—Morse Taper	No. 4	No. 4	No. 4
Diameter of spindle at nose	2½"	2½"	2½"
Traverse of head on arm	25½"	36½"	48½"
Traverse of arm on column	21½"	24"	22"
Spindle speeds with 1200 RPM motor	(60, 85, 130, 180, (425, 560, 860, (1200 RPM		on all models
Spindle speeds with 1800 RPM motor	(85, 130, 180, 274, (560, 860, 1160, (1750 RPM		on all models
Feeds per revolution of spindle	(.004" .007" (.010" .020"		on all models
Bearing of arm on column	14"	16"	18"
Size of main driving motor	2 HP.	2 HP.	2 HP.
Height of drill column over gears	89"	98"	98"
Working Surface of Base	29"x45"	36"x60"	36"x88"
Net weight	4000 lbs.	6200 lbs.	7000 lbs.

CANEDY-OTTO MFG. CO.
CHICAGO HEIGHTS, ILLINOIS

Hannifin Issues Catalogs

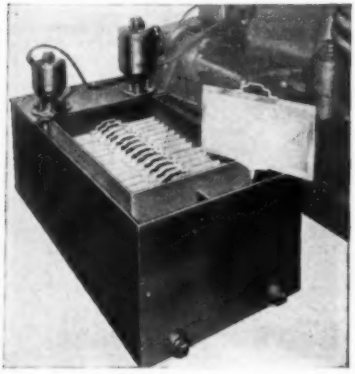
Two new 4 page catalogs, Nos. 58 and 59, have been issued by Hannifin Mfg. Co., 621-31 S. Kolmar Av., Chicago. Specially featured are their bench and drill press vises, high powered milling machine vise, and pneumatic rotating type cylinders for chuck operation.

According to the makers, this latter has many outstanding features, such as self-lubricating piston packing, simple piston ring adjustment without releasing compressed air, an effective piston shape saving greatly on compressed air use, and special intake packings.

Also described in the catalogs are their packless air control valves, hand control valves, air pressure regulating valves, automatic lubricator, spring return and treadle valves.

Hoffman Lubricant Tank

A Hoffman Model 1-10V Filter is shown installed on a Norton Hyprolap. According to the makers, this new lapping lubricant tank and filter is designed to provide a constant flow of lubricant, free from abrasives, chips, bond and dust, to the ultimate end of improving finish, increasing production and saving lubricant.



To prepare the filter, a small quantity of inexpensive filter-aid powder mixed with coolant is added to the filter-aid entry compartment. Brief circulation of the coolant suffices to form a long-lived, effective, porous filtering medium on the plates. When this filtering precoat is spent due to accumulated swarf, it is readily discharged into sump. The sump requires cleanout only after long periods. Dimensions of the tank are similar to those of a standard tank so it may be installed in the same space.

Standard equipment includes a steel tank with hinged cover; 15 filtering plates affording a total of 30 square feet of filtering area, each plate being fitted with ground filtrate spud; ¾ hp vertical direct motor driven centrifugal circulating pump assembled for simple installation. The ¼ hp coolant pump is rated to deliver 15 gpm at 12 feet head on kerosene; coolant pump on machine may be used if suitable. Shipping weight is approximately 850 lbs.

Address U. S. Hoffman Machinery Corp., Filtration Division, 219 Lamson St., Syracuse, N. Y. for further details.

Push-Tite Air Hose Couplings

An air hose coupling which offers the convenience and time saving of the familiar plug-in electric outlet is offered by Hansen Mfg. Co., 1786 East 27th St., Cleveland, O.

A slight push of the plug into the socket and it is not only connected "air tight" but the air supply is automatically turned into the hose. An easy pull back on the sleeve and the air line is disconnected, automatically shutting off the air supply. It's as simple as plugging in an electric fixture.

The makers claim that these couplings are air tight at all pressures and that there is no leakage at any time. There is no twisting or turning of parts in order to connect or disconnect and

ERRINGTON MECHANICAL LABORATORY

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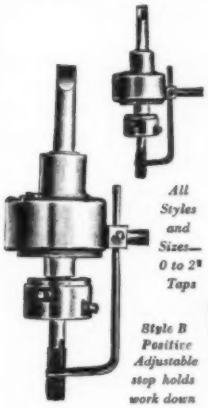
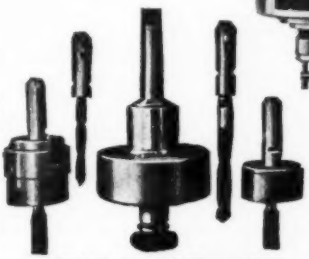
CLUTCH OR CONE DRIVE

Our High Speed Tappers are Super-Sensitive for Small Tapping

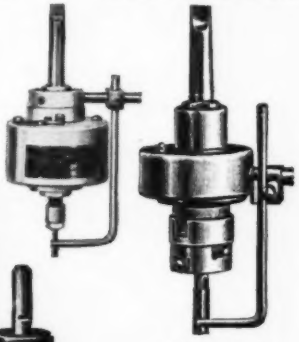


All Styles and Sizes— 0 to 2" Taps

Style B Positive Adjustable stop holds work down



Style D-E, Quick Change Tools



Style C Graduated Adjustable Safety Friction

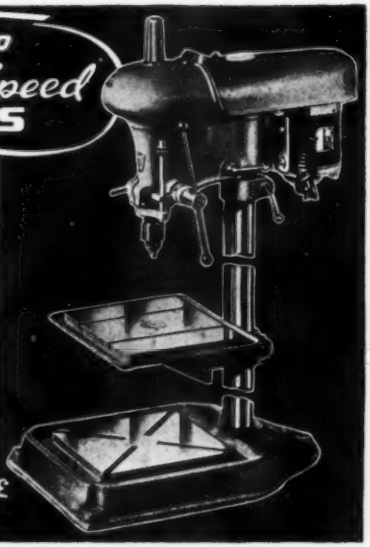
KEEP PRODUCTION UP with DURO Slow Speed DRILL PRESSES

You gain many advantages when you standardize on Duro Slow Speed Drill Presses. Massive construction for extra strength. Balanced and precision made for vibrationless performance. Improved features for easy operation. Highest quality materials for long life.

America is depending on you. Use dependable Duro Presses that will keep your production rolling. Ask for complete details.

DURO METAL PRODUCTS CO.

Dept. BB-26 - 2649 N. Kildare Chicago, Ill.



For DURABILITY use DUROBILT TOOLS

no kinking or twisting of hose due to the complete swivel action of the coupling.

Foredom Grinder Kit

A new model 111 Flexible Shaft Grinder Kit is announced by Foredom Electric Co., 27 Park Pl., New York City. It can be operated in 3 ways:—mounted onto a bench, suspended from any convenient hook, or slung from the operator's shoulder.

It comes with a 110-125 volt, 25-60 cycle motor, and their special pencil-size handpiece. Approximately 150 different accessories are available for use with the model. The complete kit, including a handy assortment of mounted abrasive points, weighs only 4½ lbs.

Air Diffusion Pattern Control

Innovations in equipment for control of air diffusion in connection with heating and air conditioning systems are offered by Air Devices, Inc., 17 East 42d St., New York City.

The different types of diffusers, one of which is shown, are used to vary the contour or shape of the discharged air stream. This particular unit is especially adaptable for air conditioning and ventilating in manufacturing plants. The different types of diffusers available provide diffusion patterns which fit the contour of the area to be ventilated. Proper diffusion means correct distribution throughout the space served, eliminating drafts, stale air or pockets, hot or cold spots, etc.

The Agitair line includes 1-a-3 and 4-way air diffusers—a size and pattern for every purpose.

Precision Gage Block Catalog

Webber Gage Co., 12905 Triskett Rd., Cleveland, has just issued an attractive 4 page descriptive catalog of their precision gage blocks. Sizes from .050 to 4.000" are available, in sets of 81 or 40 blocks. There are 2 price ranges—accurate to 4 or 8 millionths of an inch.

TWO ATTRACTIVE BUYS

Sellers No. 2A Tool Grinder.

Brown & Sharpe No. 23 Cylindrical Grinder, two motors.

REBUILT AND IN EXCELLENT CONDITION.

For particulars write

AMERICAN CUTTER & ENGINEERING CO.

31937 MOUND ROAD **WARREN, MICH.**

Classified Section

USED AND REBUILT MACHINERY

Lists of Used and Rebuilt Machinery, either For Sale, Wanted, or For Exchange, set in uniform style, will be published in the Classified Section at the rate of $5.00 for your name and address and a five line advertisement. For additional lines, 45c per line.

Write directly to those offering the machine for sale, **for prices and full descriptions. If what you seek is not advertised, write Hitchcock Publishing Company, Chicago, making known your wants on either new or used machinery and the publisher will gladly pass them along to the advertisers.**

FOR SALE BY

Aaron Machinery Co.,

176 Lafayette St., New York, N. Y.

Automatic screw machines, Cleveland, Model A, 1¼", ⅝", ¾", ⅞", 1", 2", 2½".
Borer, Rockford 3", horizontal.
Boring mill, Bullard 36" vtl., 2 heads.
Drills, radial, 3' Morris, 3½', 4' Mueller, m.d.
Engraving machines, Gorton, all sizes.
Eyeletting machines, United Shoe, Model B.
Gear cutters, 11" Gleason, bevel, (2).
Gear hobbers, G. & E. & Shuchardt & Schutte.
Gear hobbers, Barber-Colman, No. 2, 3.
Grinder, Abrasive No. 33, surface, vertical.
Grinders Brown & Sharpe No. 11.
Grinder, Brown & Sharpe No. 12 cyl.
Grinders, Bryant No. 6 internal.
Grinder, Churchill-Morgan internal.
Grinder, Cincinnati, 8x18" cyl., m.d.
Grinder, Diamond No. 3, surface, 12x36", m.d., hyd. f.
Grinders, No. 55, 60, 65, Heald internal.
Grinder, Norton, 50x28' roll, m.d.
Grinder, P. & W. 12" vertical.
Grinder, Walker 10" rotary.
Grinders, Greenfield No. 51 Hydroil int.
Grinders, Landis, m. d., 12x36".
Grinders, Modern, m. d., 12x24", 12x42".
Hammers, Pettingell trip, No. 1, 2.
Lathes, 16x8, 18x8, 18x10', quick change.
Lathe, American, 18"x8', taper.
Lathe, American, 38"x26', 5 step cone.
Lathe, Hendey, yoke, 14", 20"
Lathe, Lodge & Shipley 30"x14'.
Lathe, Putnam 26"x18'.
Lathe, 24x10' Reed-Prentice, grd. head, m.d.
Lathe, 21"x14' Reed-Prentice, geared head.
Lathe, 18-36"x7'-10' Fay Scott, sliding bed gap.
Millers, Becker vertical, No. 2, 3A.
Millers, B. & S., Cincinnati No. 2, 3.
Millers, Brown & Sharpe No. 12 production.
Miller, Cincinnati No. 3 Universal.
Screw machines, Cleveland 4⅞", 5¼", model A, auto.
Shapers, crank, 14", 16", 20", 21", 26".
Shaper, American 24", s.p.d., universal table.
Shaper, Lynd-Farquhar, open side, m.d.
Shaper, Steptoe 24", m.d.
Turret lathes, Bardons & Oliver No. 2, (4).
Turret lathes, 24", 32".
Turret lathes, Gisholt, 28", 21".
Turret lathe, Foster, No. 1B univ., s.p.d.
Turret lathe, Warner & Swasey, No. 2A, univ., s.p.d.
Hydraulic pumps, presses, accumulators.

FOR SALE BY

Siegman Machinery Co.

561 W. Washington Blvd., Chicago, Ill.

Automatics, Clevelands 7/8" cap. (2) Model A, collets.
Boring mill, Morris horiz., 3" bar.
Gear cutters, hobbing, Barber Colman No. 12, (2).
Grinder, Bryant No. 10A.
Grinder, Heald, 65, internal.
Grinders, internal, Tromatic No. 12, (2).
Grinder, worm gear, Pratt & Whitney, m.d.
Lathe, Lo Swing 4"x60", grd. head, dble. carriage.
Lathe, 26"x12' Schumacher-Boye, quick change.
Mill, Lincoln type Carter & Hack.
Spot welder, Taylor 33 KVA, 1¼ thrt.
Please send us your inquiries.

Ogden R. Adams

264-66 State St., Rochester, N. Y.

Main 6374-5

Brake, leaf, double truss cornice, 18 ga., 8'.
Brake, leaf, 10' Dreis & Krump, 18 ga.
Forming machine, 52" Bertsch slip roll, 4" dia. rolls, 12, 14 ga., b.d.
Shear, rotary, No. 260 Pexto, 16 ga., b.d.
Shear, squaring, 36" Pexto, foot, 18 ga.
Shear, squaring, 36" Niagara, foot, 18 ga.
Shear, squaring, foot, 42" Pexto, 18" gap, 16 ga.

Trayer Products, Incorporated

Elmira, N. Y.

Furnaces, No. 2B American rotary, with pyrometer & motor, no retorts, (2).
Gear rougher, 15" straight bevel, Gleason, 3 spindle.
Screw machine, 7/8" model M, 4 spdl., Cleveland, cut-off, with motor drive.

J. W. Appley & Son, Inc.

829-31 Ninth St. N., St. Petersburg, Fla.

Super finisher, Ohio units, for round work, 10"x36" attachments for crankshafts included. Cost now over $1000—sell for $800 cash. Self contained m.d. in base.

USED AND REBUILT MACHINERY

FOR SALE BY

Failor-Strafer Machinery Co.

132 Liberty St., - - New York, N. Y.

Blue print drying machine, 42" Paragon.
Boring mill, Binsee 4" bar, knee-type.
Drills, Canedy Otto 21', sensitive radial.
Flanging machine, No. 4 McCabe.
Gear cutter, 36" Gould & Eberhardt.
Grinder, Norton plain cylindrical, 10"x36".
Keyseater No. 1 Davis.
Lathe, 24" Davis, heavy duty turret.
Lathe, 32"x12' Putnam.
Lathes, 24"x32', N. B. P.
Lathes, 24"x10', Lodge & Shipley, turret on shears.
Lathe, 16"x5' Sidney.
Miller, No. 2 Shields, high power, single pulley.
Miller, 48" Newton continuous.
Press, No. 74½ Bliss, geared, straight side.
Press, No. 1 Bliss toggle.
Screw machine, No. 1½ S. G. Garvin.

S. M. Regar Machinery and Mill Supplies

Tampa, - - - - - Florida

Boring mill, Bickford, hor. spd., g. b., tbl. type size 4.
Boring mill, Niles 36" 2 swivel heads.
Broaching machine, La Pointe No. 3-B, b.d.
Drill presses, upright, from 14" — 36" sliding and stationary heads, back geared and power feeds.
Grinder, Bridgeport, face, 26" wheel, 11' bed.
Lathes, Gisholt 24" and 21" production (2).
Lathes, LeBlond 17" & 19" rapid prod. q. c. feeds, (3).
Lathes, National 18" production, (8)
Lathe, Bullard 22"x8', turret head.
Lathe, Jones and Lamson 2x24", flat turret.
Lathe, Pittsburgh 36"x18', solid spindle, q. c. g., raising blocks, 48".
Shaper, Putnam 36", friction feed.
Slotter, 18" Bement Miles, No. 487 power cir. table.

Jones Machine Tool Company

Front & Pike Sts., Cincinnati, Ohio

BORING MILLS AND MILLERS

30" Flather, 1 hex. head.
60" Poole, 2 swivel hds.
72" Gisholt, 2 swivel hds.
No. 1½ Amer. pl. cone dr.
No. 3 B. & Sharp, plain.
No. 4 Cin., univ., c.d.

LATHES

16"x6' Am. q. c. cone dr.
18"x8' Le B. q. c. cone dr.
18"x8', Nat., q.c., gd hd.
18"x8' Boye E. q. c. c. d.
18"x12' Boye & Em., q.c.
20"x8' Am. 3 st. q. c., d. b. g.
18"x12' Whit. c 3 st. q. c.,
18"x12' Spring. c., s. b. g.
24"x8' S. & B., l.c., s.b.g.
24"x10 Niles, l.c.
30"x10' Niles, l.c.

SHAPERS AND PLANERS

16" Cin. b. g. cone dr.
24" Smith & Mills, c.d.
24" Cin. b. g., cone dr.
24" American, cone dr.
30"x30"x10' Am. pl. 1 hd.
36x10' Bickett, 2 heads.
36"x12' American, 1 hd.
36x16' Putnam planer, 1 rail & 1 side head.

PRESSES AND SHEARS

No. 76 Tol. s. o. b. g.
No. 21 Bliss, O. B. inc
Wickes, sgle. end punch.
No. 4 Rockford, b. gd.
No. 15 Tol. deep throat
52" Foot square shear.
No. 44 Niagara dp. thrt.
Robinson s. s. press, 16" bet. housings.

MISCELLANEOUS

19" Gleason gear gen.
48" B. & S. gear cutters.
Style "F" Bak. h.d. drills.
No. 2 M. & M. Keyseat.
2'—Amer. radial, s.p.d.
3'—Mueller radial, s.p.d.
12x12 Racine hk. saw.
6x6 Peerless hack saw.
20 k. w. spot weld.
24" Gisholt turret lathe.
150 t. Firestone hyd. pr.
2" Acme bolt cutter.

FOR SALE BY

B. D. Brooks Co., Inc.

361 Atlantic Ave. Boston, Mass.

Sheet metal working machinery, hand and power.
All types of new and reconditioned equipment.
Apron brakes, press brakes, shears, folders.
Bending rolls, corrugating rolls, forming rolls.
Punches, beaders, rotary machines, stakes, etc.

Russell Machine Co.

438 Oliver Bldg. Pittsburgh, Pa.

Bulldozer, No. 4 Wms. & White, m.d.
Gear cutter, spur, 84" Newark, m.d.
Gear planer, bevel, 54" Gleason m.d.
Gear planer, Bevel, 36" Gleason, b. d.
Lathe, 42"x17'6" Pond, p.c.g., triple grd., b.d.
Lathe, turret, No. 4 Warner & Swasey, b. d.
Lathe, turret 24" Gisholt, 5" hollow spindle.
Lathe, turret, Libby type C-7, 7½" hollow spindle.
Press, hydraulic, 100 ton Watson Stillman, m.d.
Press, hyd. 1000 ton wood platen, 42"x8'.
Punch, multiple, style "E" L&A 15½" th. cap. 340 tons.
Punch, beam, Cleveland, cap. 24".
Punch & Shear, Cleveland F F 1½" thru 1", b.d.
Screw machine, 1" Garvin, fully equipped.
Shear, Alligator, No. 61 Carlin high knife, 2½" sq.
Shear, plate, 10'x3" Wheeling, m.d.
Slotter, 18" Bem. Miles, table 36" dia., b.d.
Upsetting machines, 2½, 3½, 4 and 5" Ajax iron bed.

Wm. C. Johnson & Sons Machy. Co.

1211 Hadley St., St. Louis, Mo.

Air compressors, 15 in stock.
Bolt threaders, 1", 1½" & 2" Acme.
Drill, Natco 13 spindle, No. 1 taper.
Drill, No. 2 Fox, 6 spindles.
Drills, radial, Dreses, 3' & 6'.
Drills, radial, Drillmaster, new.
Drills, Sipp, m.d., single spindles, (2).
Forging machine, Ajax 2".
Gear cutters, No. 1 Whitons, (2).
Grinder, 10"x30", Ottcyl.
Grinder, 12"x60" Modern.
Hammers, 300 lb. Beaudry, 75 lb. Bradley, 50 & 100 lb. Little Giant.
Hobber, Adam No. 1, like new.
Lathes, 10x24, Logans, m.d., new in stock, (10).
Lathe, 18"x8" Prentice, gd. head.
Lathes, 20x8' LeBlond, q.c.g.
Lathe, 21"x10" LeBlond, q.c g., m d.
Lathe, 22"-46"x16' Putnam q.c., sliding bed, gap.
Lathe, 26"x14" Hamilton, q.c.g.
Lathes, 62" Niles locomotive wheel.
Miller, Burr, 92" table.
Miller, No. 3 Knight vertical.
Pipe machines, 2"—4"—6"—8"—12".
Planer, 30"x30"x6' Pond, 1 head.
Planer, 36"x36"x8' Gray, 2 heads.
Planer, 32"x32"x18' Gray, 2 heads.
Planer, 48x48x20', Sellers.
Planer, 60"x60"x10', Sellers.
Press, 55 Swaine.
Press, 69 N Bliss, double acting.
Press, wheel, 200 ton 48" Niles.
Press, Excelsior, hydraulic 200 ton vert.
Punches, shears, bulldozers.
Roll, plate straightening, H. & J. No. 2, like new.
Shapers, 12"—16"—20"—24".
Welders, spot, new—3 in stock.

Large stock guaranteed electric motors. Any size.

USED AND REBUILT MACHINERY
FOR SALE BY
Lang Machinery Company — 28th St. & A. V. R. R. — Pittsburgh, Pa.

Air compressor, 6"x6" Ing.-Rand, 63 c.f.m., m.d.
Air compressor, 10"x10" Ing.-Rand. 245 c f.m., m.d.
Air compressor, N-503 Chicago, 492 d.f., oil dr.
Air compressor, Ing. Rand EK-I 148 c f., b.d.
Air compressor, 10"x10" Ing-Rand, 200 c.f., m.d.
Bolt cutter, 1" Landis, 1½"-3"agi.hd., b. d.
Bolt cutter, 1" Acme, 2 Landis heads.
Bolt cutter, staybolt 1½" Acme, headscrew, m.d.
Boring mill, horiz. Barret 3½" b.d.
Boring mill, horiz., 5" bar Barrett, b.d.
Boring mill, vert. 42" Bement-Miles, 1 head, b. d.
Bulldozers, No. 2 & No. 4 Wms. & White, m.d.
Centering machine, P&W. 4" 2 spdl., b.d.
Crane, 5 ton O E T, 43'6" span, m.d.
Column facer, 30" dia. Espen Lucas, b.d.
Cut-off machine, 3" Hurlburt Rogers, b.d.
Cut-off machine, 16" Treadwell, m.d.
Die filer, Rearwin, tbl. 18"x17", str. 8".
Die filer, No. 3 Thiel, m.d.
Draw bench, Aetna-Standard, 25,000 lb., 36' long, m.d.
Drill, 2-spindle Woodward-Rogers, m. d.
Drill, mult. No. 3 Rockford 3 spdl., s.p.d.
Drill, mult. 4 spdl. Foote-Burt hvy. duty, m.d.
Drill, mult. 10 spindle D-12 Fox, b. d.
Drill, radial 2' Mueller, t.a., m.d.
Drill, radial 2' Prentice, m.d.
Drill, radial, 3½' Prentice, t. a., b. d.
Drills, upright, 11" to 34", b. d. & m. d.
Gear cutter, spur, 30"x16", B. & E., m. d.
Gear cutter, spur 36"x9" G. & E. m. d.
Gear cutter, spur 40"x12" G. & E., s. p. d.
Gear cutter, spur, 84" Newark, m. d.
Gear miller, No. 1 Bilton, cap. 4", b. d.
Gear planer, 36" Gleason, bevel, m.d.
Gear planer, 84" Gleason, bevel, m. d.
Generator, 100 KW Westinghouse d c., 125 v. b. d.
Generator, 150 KW Jeffrey, d. c. 250 v. b. d.
Grinder, cyl., 10"x30" Landis, b. d.
Grinder, cyl. No. 14 Brown & Sharpe, m. d.
Grinder, cyl. Wells 6"x14", m. d.
Grinder, dbl. end, Standard Elec. 7½ H. P. 220 v. d. c.
Grinder, dbl. end, 24" Marschke, m.d.
Grinder, d. e. 12" Marschke, m. d.
Grinder, disc No. 6 Gardner, 10 H.P., m.d.
Grinder, drill, No. 5 Oliver, m d.
Grinder, gear tooth, Detroit No. D-12, m. d.
Grinder, internal cylinder, No. 5 Landis, b. d.
Grinder, suface Covel, tbl. 21½"x6", m. d.
Grinder, tool & cutter, No. 1 Cin. univ. b. d.
Grinder, tool & cutter, Ingersoll inserted tooth, m.d.
Grinder, univ., No. 5 B. & S., 20"x72", b. d.
Grinder, worm-hob. Pfauter "FS", b.d.
Grinder, No. 60 Heald, b. d.
Hammer, 50 lb. Little Giant, s. p. d.
Hammer, power 300 lb. Bradley compact, m.d.
Hammers, steam drop, 400 lb. to 8000 lbs.
Hammers, steam forging, 800 lbs.—4000 lbs.
Hoist, electric 5 ton Euclid, a. c. m. d.
Keyseater, No. 3½ Baker. 3½", m. d.
Lathe, 15"—24"x8' Sebastian grd. head, m. d.
Lathe, 16"x6' Emmes, p. c. g., s. b. g., b. d.
Lathe, 16"x8' Rockford, semi-q. c. g., s. b. g., b. d.
Lathe, 19"x6' Milwaukee, semi-q c.g., d.b.g., b.d.
Lathe, 19"x8' Prentice turning, d. b. g., p. c. g., b. d.
Lathe, 20"x8' Reed, p.c.g., s.b.g., b.d.
Lathe, 20"x12' Reed-Pren. grd. head, q. c. g., m. d.
Lathe, 21"x8' LeBlond hvy. duty, d. b. g., b. d.
Lathe, 21"x16' Bradford, t.a., b.d.
Lathe, 27"x11' LeBlond, grd. hd., q.c.g., d.b.g., m.d.
Lathe, 27"x12' Putnam, hvy. duty, q c. g., d.b.g., b. d.
Lathe, 26"x14' Putnam hvy. duty, d.b.g., b.d.
Lathe, 36"x28'6" New Haven, p. c. g., b. d.
Lathe, 42"x22' American, b.d.
Lathe, 42"x 20' Springfield trip. grd., p. c. g., b. d.
Lathe, 42"x 17'7" Pond, triple grd., p.c.g., b.d.
Lathe, 48"x22½" Johnson, trip.gd. int .face pl. dr. b.d.
Lathe, 48"x26½" Johnson, trip. gd. int. face pl. dr. b.d.
Lathe, wheel 78" Bement-Miles, m. d.
Lathe, gun boring, 2 bar, cap. hole 12"x40', m. d.
Lathe, turret 21-H Gisholt, h.s. 2-1/16", b.d.
Lathe, turret 24-I Gisholt, h.s. 5½", m.d.
Lathe, turret 24" x26" P.&W. grd. head, s.p.d.
Lathe, turret 28" Libby "C", h. s. 8", m.d.
Lathes, turret No. 1-A, W&S, h.s. 3-1/16", s.p.d.
Lathe, turret 3" x36" J&L, bar & chuck, s.p.d.
Lathe, turret Acme 14" x9", h. s. 1½", b. d.
Miller, vert. No. 2 Becker, tbl. 30"x8½", m. d.
Miller, vert, No. 4-B Becker, tbl. 36" x10½", m.d.
Miller, thread, Smalley General, cap. 12"x36", m. d.
Miller, plain No. 12 B & S., tbl. 37"x10", b. d.
Miller, slab, Ingersoll tbl. 9½'x21", b. d.
Nipple threaders, ½"-1½" & 2" Landis. b.d.
Picking machine, Mesta, 8-12' arms.
Pipe machines, 8" Williams, 2½" to 8" motor drive.
Pipe machine, 12" Landis geared head, m.d.
Pipe machines, 3"—4"—12" & 18" Weiland, b. d.
Planer, 30"x30"x8' Cincinnati., 2 heads, m.d.
Planer, 36"x36"x10' American, 2 heads, m. d.
Planer, 36"x36"x11' Sellers, 2 heads, rev. m.d.
Press, double acting, No. 1 Bliss, roller feed.
Press, dbl. cr., 96-F Toledo, 12" str., Bolster 65"x124"
Press, end wheel Stiles-Parker, stroke 14".
Press, end wheel No. 3 Bliss, roll feed, m d.
Press, hydraulic, 1000 ton, Watson-Stillman, m. d.
Press, 250 ton Baldwin Southwark 4-post.
Press, forging, 1500 ton Farrell-Birmingham, m.d.
Press, hydr. Woods 1000 ton, platen 42"x9'.
Press, o. b. i. No. 68-C Bliss, stroke 5".
Press, perforating, No. 51 V&O, str. 4", dbl. crk.
Press, straightening, Hunt hydraulic, 50 tons.
Press, straightening, 30 ton Manley, lever action.
Press, toggle, No. 1½ Bliss, m.d.
Pump, Worthington 9"x2"x12", 22 gpm. 3000 lb. steam.
Punch, lever, No. 58 Niagara, 36" throat.
Punch, mult. 20' L & A. cap. 340 tons pressure.
Punch, mult. No. 8 H. & F., 1400 tons, m. d.
Punch & shear, No. 3 L & A, rap. act. ¾"-⅝".
Punch & shear, Cleveland "G", 2" thru 1", m. d.
Punch, s.e., 3-A Royerasford, arch. jaw, 10" thrt., m.d.
Punch, No. 6 L&A, 16½" thrt. ⅜"-½".
Riveter, pneu., Hanna, 30 ton, 75" reach.
Riveter, pneu., Hanna, 80 ton, 126" reach.
Riveter, pneu., Hanna, 150 ton, 150" reach.
Saw, band Type J M Laidlaw, 20", m. d.
Saw, cold, Espen Lucas, blade 22", cap. 6" rd.
Screw machine, Garvin, cap. 1", m. d.
Shaper, draw-cut 48" Morton, m.d.
Shaper, traveling head, 90", Bement, m.d.
Shaper, 16" Cincinnati bi-duty, m. d.
Shear, allig. Pittsburgh, cap. 3"-24", m. d.
Shear, allig. No. 7 United, 6" square, m. d.
Shear, alligator, No. 61 Carlin, 3" round high knife.
Shear, circle, No. 05 Niagara, b. d
Shear, foot Niagara 36"x18 gauge.
Shear, plate, 48"x1" H. & J., m. d.
Shear, plate, 72"x1½" United, m. d.
Shear, plate, 132"x¾" Wheeling, gap. 18", m.d.
Shear, plate, 10'x¾" Pittsburgh, gap, 15½", m. d.
Shear, plate, 125"x3/16" Hyde Park, gap 18", m.d.
Shears, plate 156"x3/16 Hyde Park, gap 17", m. d. (2)
Shear, plate 156"x3/16" Standard, gap 18", m.d.
Shear, plate, 9'x1" Mesta, throat 36", b. d.
Shear, squaring 10'x3/16" Ohl, b. d.
Shear, sq. 84"x1/16", Hyde Park, thrt. 8½".
Shear, sq., 36"x¾" United, b.d.
Slip rolls, 36" Pexto, cap. 14 gauge.
Slotter, 18" Bement, take 36" b. d.
Upsetter, 4" Ajax, steel bed, m.d.
Upsetter, 2½" Acme, steel bed, m.d.
Vertical attachments, Nos. 1. 3, 4 and 5 millers.
Straight'ner, shape, No. 3 Sutton, 2-way cap. 2½", m.d.
Tapping machine, duplex Garvin 2-X, ½"-1", b.d.
Thread miller, 4½"x12" P&W, m d.
Thread Miller Smalley General, cap. 14"x3", m.d.
Welders, 150 amps. and 200 amps. portable.
Welder, 200 amp. Lincoln, 4-cyl. gas engine.
Wire straightener, ¼" Schuster, 4' cut-off, b.d.

USED AND REBUILT MACHINERY

FOR SALE BY

Matson Machinery Sales
513 Brumder Bldg., Milwaukee, Wis.

Boring mches., Auto Machine Co., vert. h.f., m.d., (2)
Broach, La Pointe, with assort. of broa.hes.
Broach, oil gear, horiz., h.f.
Die casting mach., Kipp caster No. 115.
Drill press & tapper, Leland Gifford, with m.d.
Drilling mch., Columbus 8 st. vert. auto. turret, m.d.
Lathe, Amer. q.c.g., 30"x27", cone pulley.
Lathe, Amer. 88"x38' with grinder cone pulley.
Punch, Williams & White No. 32 multiple, 12" ram.

The Nutmeg State Machinery Corp.
1041-1051 State St., New Haven, Conn.

Boring mill, Bullard 42", 2 head on rail.
Drill press, Henry & W., 6 spl., class B, 12" overhang.
Drill press, Leland Gifford, 3 spdl., p.f. to each spdl.
Drill press, Leland Gifford, 4 spdl., p.f. to each spdl.
Drill press, Sipp, 6 spindle, b.b.
Drill presses, Henry & Wright 4 spdl., class B, b.b.
Drill, radial, Amer. 3½, (2), one with oil gr. base, s.p.d.
Drill, radial, Fosdick 4' pl., with oil groove base, s.p.d box table.
Drill, radial, Mueller, 2½' pl., with oil gr base, s.p.d.
Gear cutter, Gould & Eberhardt No. 1½, spur & bevel.
Grinder, Brown & Sharpe No. 3 universal.
Grinder, Landis No. 2 universal.
Grinder, Landis, 12"x66" universal.
Grinder, Norton 10"x24", plain.
Grinder, Norton 10"x16", plain.
Grinders, Bryant No. 30, m.d. internal chucking, (3).
Millers, Brown & S., No. 13B production (2) 1 tap. nose.
Thread miller, Lees Bradner No. 3C, with 9 collets, 6" hole in spindle.
Thread miller, Pratt & Whitney, 6"x48".
Turret lathe, Warner & Swasey No. 3A.

Joseph Hyman & Sons,
Tioga and Almond Sts., Philadelphia, Pa.

WORLD'S LARGEST STOCK
POWER PRESSES

No. 182D Cleveland, double crank, 76", crank 4".
No. 204A Toledo, double crank, gap.
No. 4 United Eng. & Fdry., 4 crank, 156" between uprights, 8" dia. crank 7½" stroke, weight 118000 lbs.
No. 6B Niagara, dbl. crank 36", crank 3½".
No. S 126 Ferracute, dbl. crank 124", crank 7½"—9".
No. 106 Bliss gap, double crank, geared.
Nos. 92B, 91B & 91C Toledo, double crank.
No. SG83 Ferracute, 46", 100 tons cap.
No. S182 Ferracute, 52", 9" crank.
No. 59½ Toledo, tie rod.
No. 211S Hamilton, tie rod, 500 tons cap.
No. DG 56 Ferracute, 100 tons.
Nos. 74½, Bliss straight side.
No. 407-56 Bliss, toggle, double crank, t. r.
Nos. 1½, 3½C Bliss toggle presses.
No. 164 Toledo toggle.
75 ton EG51 & E51 Ferracute, knuckle joint.
600 ton American Can, knuckle joint.
150 ton KG52 Ferracute, knuckle joint.
No. 1 Toledo, o. b., i., (8).
Nos. 2 & 5 Standard auto. drops.
No. 9C Badger State combination punch & shear.
No. 6 Hilles & Jones multiple punch.
Punches & shears, single & double end.
Squaring shears, various sizes.
These and hundreds of others of popular makes and sizes, are in stock at our warehouse here.

Rebuilt and Guaranteed.

FOR SALE BY

The F. E. Worch Machinery Co.
P.O. Box 202 2049 Westover Rd.
Columbus, Ohio

Drill, No. 1 Avey bench.
Drill, 4 spindle Francis Reed, ½".
Grinder, plain, Ott 5"x18".
Grinder, tool, No. 30W Sellers.
Lathe, 18"x8' Hamilton, q.c.g., cone.
Lathe, 20"x14' American, q.c.g., cone.
Planer, 30"x30"x8' Ohio, 1 head.
Planer, 32"x32"x12' Gray, 1 head.
Press, o.b.i., 42 ton pressure
Press brake, Chicago No. 508D, cap. 5/16"x8'.
Shaper, 20" G&E, cone.

E. L. Klauber Machinery Co.
3221 Olive St. - - St. Louis, Mo.

Centering machines, revolving head type.
Disc grinder, 18" Besley, arranged for m.d.
Gear hobber, No. 000 Schuchardt & Schutte, 4".
Grinders, cutter & tool.
Hammer, Bradley strap, 30 lb.
Lathes, precision bench, Ames, Stark, Elgin.
Lathe, 14"x8', Fay & Scott, gap bed, m.d. with instant speed control.
Polishing machines, No. 11 Hanson-Van Winkle, m. d.
Press, No. 58 Crosby, open back inclined.
Press, No. 69N Bliss O.B.I., double action.
Radial, 3½' Canedy Otto, wall type.
Radial, 2½' Carleton, sensitive, belt.
Riveting machine, No. 4-A high spd., rot. vibr. type.
Turret lathe, No. 6 Foster, gd. friction head, p.f.t.

Standard Machinery Co.,
347 Indiana Ave. Grand Rapids, Mich.

Cut-off, abrasive, Tannewitz type M-2.
Drill 25" Superior, sliding head.
Drill, 40" New Haven No. 5, sliding head.
Drill, radial, Western 4', motor drive.
Grinder, cylinder, Heald No. 65.
Keyseater, No. 9 Mitts & Merrill.
Lathe, turret, Warner & Swasey, No. 2.
Lathes, mig., 12"x6' Pratt & Whitney, (2).
Roll former, Kane & Roach, 2 sets spindles.
Tapper, Anderson No. 40 Dial Feed Auto.
Welder, Expert Portable spot, 50 KVA.

Reliance Machinery Sales Company
1407 Brighton Place, N.S. Pittsburgh, Pa.

Air compressors, 139 and 450 cu. ft.
Brake, press, 6'x16 ga., Robinson, toggle.
Bulldozer, No. 4 Williams-White.
Grinder, 12x32" Bath univ.
Grinder, No. 14 Besley double disc, 26" discs.
Hammers, 50 lb. Mayer, 40 lb. Bradley helve.
Lathe, 36"x18' New Haven, plain change.
Lathe, 27"x15' Prentice, taper. arr. m. d.
Miller, model C Becker vertical, m.d.
Miller, 30"x10' Newton slab, m. d.
Press, No. 82 C Toledo dbl. crank, 44" wide, 8" shaft, 2" stroke, m. d.
Pump, Goulds centrifugal, 3 stage, 250 g.p.m. against 347' head, m. d., 3-60-220 v.
Pump, hydraulic, 15 G.P.M., 1500 lb., m.d.
Punch, 48" throat Beatty, 1" thru 1", m.d.
Shear 13'x5/16" plate, 15" gap, m.d.
Swaging machine, No. 5 Etna, cap. 3" tubes.

What do you need? What have you for sale?

USED AND REBUILT MACHINERY

FOR SALE BY

West Penn Machinery Company

1210 House Building, Pittsburgh, Pa.

Air compressors, 30 to 2500 cubic feet.
Baling press, paper, Logemann, b.d.
Blower, No. 4 Roots, capacity 2110 c. f. m
Bolt cutter, 1" Acme triple head, m.d.
Bolt cutters, 1¼"-2"-3"-4" Acme, b.d.
Boring mill, 6" Niles, knee type, b. d.
Buildozers, Nos. 2, 4, 6, 9, 28, & 30.
Crusher, jaw, No. 4 Champion, b. d.
Die filer, No. 3 Thiel, m. d.
Drill sharpener, Ing.-Rand "Leyner", 1¼".
Drill, radial, 5' American, semi-univ., b.d.
Drills, upright 10" to 36".
Drill, No. 310 Baker, No. 5 M.T., m.d.
Engine, gas, 20 horse power Bessemer.
Gear tester, bevel 18" Gleason.
Gear cutter, No. 6 B. & S., 72", m. d.
Gear hobber No. 1 Adams, 12", b.d.
Generator, plating 6-v. 3500 amps.
Grinder, disc, 53" horizontal, Gardner.
Grinder, "Kwick-Way" all purpose, m.d.
Grinder, internal, No. 60 Heald, b.d.
Grinder, knife 16' Bridgeport, m.d.
Grinder, roll, Farrel 30"x16".
Grinder, roll, 54"x16' Norton, m. d.
Grinder, surface vertical, 30" table, 16" wheel, m.d.
Grinder, No. 2 tool & cutter, Greenfield, b.d.
Hammer, drop board, 500 lb. B. & S.
Hammer, drop board 800 lb. B&S.
Hammers, 50 lb., 75 lb., 100 lb., 200 lb. Upright.
Hammer, 100 lb. Bradley cushioned helve.
Hammers, Nos. 2-B, 3-B, 4B, 6-B, Nasel.
Hammers, steam, forging & drop.
Keyseater, No. 1 Davis, 1"x8", m.d.
Keyseater, No. 1 Baker 1½"x12", b d.
Keyseater, No. 2 Baker, 2"x20", b. d.
Lathes, speed, 11" and 12" Blount, m. d.
Lathe, brass 18x6", friction head, power feed, b. d.
Lathe, 7"x32" P&W, precision, m.d.
Lathe, 18"x8' Rockford, b. d.
Lathe, 18"x12' Hendey, geared head, t. a.
Lathe, 20"x10' Springfield, t. a., m.d
Lathe, 24"x10' Prentice, b.d.
Lathe, Lo-Swing, 6"x60", s. p. d.
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Lathe, turret, 1¼" W&S., barfeed, b d.
Lathes, turret, Nos. 1, 2 and 3 W. & S., b. d.
Lathe, turret, 2 spindle J&L., 2-7/8", m.d.
Locomotive, gas, 8 t. n Milwaukee, 36".
Miller, plain, No. 2 Kempsmith, b. d.
Miller, universal, No. 2 Putnam, b. d.
Miller, shaper, duplex, No. 14 Cochrane-Bly, m.d.
Miller, Lincoln, No. 12 P. & W. 32"x7½", b. d.
Miller, vertical, Burke, table, 16x8, b d.
Nibbler, No. 1 Campbell 3/16", 6" gap, m. d.
Nibbler, L.&A., 1", 36" throat, m.d.
Pipe mche., 2", 4", 6", 6"-12"&16" Landis-Oster-Williams.
Planer, 39"x36"x12" Cincinnati, 2 hds., b.d.
Press, forging, 150 ton United, steam hyd.
Presses, h. rming, Nos. 38 & 38½ Bliss, b. d.
Press, s. s., No. 7 Am. Can, 3" stroke.
Press, arch, No. 30 Bliss, b.d.
Press, strip feed, No. 3 C McDonald, b.d.
Press, No 80½ Toledo, 12" stroke.
Press, No. 19 Bliss o.b.i., b.d.
Presses, Stiles, type, 1½ and 3½" m. d.
Punch & shear, "E" Cleveland 1"-1", b.d.
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Grinder, 16x42" Landis plain, b.d.
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14"x6' American, cone (2)
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16"x6' Carroll-Jamieson, cone
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16"x8' Greaves-Klusman, cone
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18"x8' Bradford, cone
18"x8' Lodge & Shipley, cone
18"x8' Mueller, cone
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18"x10' Springfield, cone
18"x12' Barker, cone
18"x12' Schumacher-Boye, cone
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20"x10' Lodge & Shipley, cone
21"x8' LeBlond, cone
21"x10' LeBlond, cone
21"x16' LeBlond, cone, taper
22"x12' Greaves-Klusman, cone
22'x13' Niles, cone
22"x16' centers American Super Lathe Geared Head, 100 H.P. motor
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No. 2 Pratt & Whitney Hand
C17 Newton Vertical Slab
No. 2 Garvin Lincoln Type
Gooley & Edlund Type A
Putnam Briggs Type
C66A Newton 3 spindle Continuous
30"x28"x8' Ingersoll Planer Type
36"x14' Bement Slab
40" Ohio Tilted Rotary
48" Oesterlein Tilted Offset, Timken Bea
Carter & Hakes Mfg.

PLAIN CYLINDRICAL GRINDERS

6x32" Norton, m.d.
10x18" No. 14 Brown & Sharpe
10x24" Landis, m.d.
10x30" Queen City, m.d.
10x36" Landis Integral Cam, m.d.
10x36" Norton, m.d. (5)
10x50" Norton, m.d.
10x52" Landis, m.d.
12x36" Cincinnati, belt
12x36" Cincinnati, m.d.
12x36" Modern, m.d.
12x42" Landis, belt
12x48" Modern, m.d.
12x72" Cincinnati, 3 m.d., hydraulic
10x72" Norton, m.d.
14x50" Norton, m.d.
16x52" Landis, m.d.

UNIVERSAL CYLINDRICAL GRINDERS

No. 3, 4 Brown & Sharpe
12x42" Landis
12x48" Modern
18x72" Cincinnati Automotive Parts

CENTERLESS GRINDER

Cincinnati Valve Seat, m.d.

INTERNAL GRINDERS

No. 12 Bryant, 2 motor drive
No. 10 Bryant, belt

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. 1 Fraser Lapper, belt
x48" Diamond L.D. Face, m.d.
x84" Diamond H.D. Face, m.d.
' Bridgeport Knife, belt
vell-Hanchett Knife, m.d.

CYLINDER GRINDERS
. 50 Heald, hydraulic
. 55, 60, 65 Heald

DISC GRINDERS
. 4 Gardner
. 6 Diamond
. 20 Gardner Combination Disc & Roll
. 120 Gardner Plain
. 120 Gardner

RADIAL DRILLS
6' Avey Sensitive
American Sensitive
Carlton Sensitive
Hammond Jack Knife
Prentice Plain, cone
Niles Semi-Universal, cone
Prentice Plain, cone
. 1 W. F. & John Barnes Horizontal

BALL BEARING DRILLS
spindle Allen
spindle Demco
spindle Henry & Wright
spindle Leland & Gifford
spindle Henry & Wright
spindle Leland & Gifford
spindle Cincinnati Pulley Machinery
spindle Demco
spindle Edlund
spindle Henry & Wright
spindle Allen
spindle No. 2 Fosdick
spindle No. 3 Foote-Burt
spindle Gardam
spindle Henry & Wright
spindle Kokomo

MULTIPLE SPINDLE DRILLS
spindle No. 2 Foote-Burt
. 00S, 1SS Garvin Horizontal Duplex
. 1 Pratt & Whitney 2 spdle. Gun Barrel
2, 3 Baush Multiple
Fox Multiple Straight Line
7D Moline 2 spindle Cylinder Borer
15HC Fox, hydraulic
25 Baush Multiple Straight Line
26C Fox Tapper
37 Natco
51C Harrington
220 Baker 2 spindle
ckford Horizontal Drill

HEAVY DUTY DRILLS
', 20", 22", 22½", 26", 28" W. F. &
ohn Barnes
' Canedy-Otto
21", 22", 24", 32", 36" Aurora
21", 25", Weigel
22", 4" Barnes All Geared Self-Oiling
32", 36" Cincinnati Bickford
40" Prentice
No. 2, 22 Colburn Mfg.
No. 3D Minster

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Cincinnati Mill Broach, m.d., brand new
No. 2, 3, 4 J. N. LaPointe, m.d. in gear box
No. 2 LaPointe, belt
No. 3 J. N. LaPointe Double, belt

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Gleason Spiral Bevel Rougher, s.p.d.
6", 18" Gleason Straight Bevel Gear Generators
16" Gould & Eberhardt Gear Cutter
No. 1—26" Whiton Full Universal Gear Cutters
No. 3-26", 3-36", 3 Heavy, 4-36", 4-48", 6-60", 6-72" Brown & Sharpe Gear Cut.
No. 3-26' Cincinnati Gear Cutter
No. 5A Lees-Bradner Gear Generator
Cross Gear Tooth Rounder, belt
20" Rochester Gear Tooth Rounder, belt

PLANERS
22"x22"x6' G. A. Gray, 1 head
24"x24"x5 G. A. Gray, 1 head
24"x24"x12' Chandler, 2 heads
30"x30"x8' Cincinnati, 1 head
32"x32"x12' G. A. Gray, 2 heads
42"x42"x12' Niles-Bement-Ponds, 2 heads, box table
42"x42"x18' Cincinnati, 2 heads

TURRET LATHES AND SCREW MACHINES
No. 0 Brown & Sharpe Hand, cone
No. 4 Bardons & Oliver, cone
No. 4 Foster, cone
2¼" Acme Flat Turret, cone
2¼x24" Jones & Lamson Geared Head, bar feed (3)
3x36" Jones & Lamson Geared Head, chucking
3x36" Jones & Lamson Geared Head, bar
3x36" Jones & Lamson Geared Head 2 spindle, chucking
3¼x40" Greenlee Flat Turret, cone
16" Warner & Swasey Turret, cone
18" Acme Turret, cone
21" Gisholt Tilted Turret, m.d.
24" Gisholt Tilted Turret, m.d.

RIVETERS
No. 2A, 3A High Speed Riveting Hammers
¼" Shuster, belt
Hanna Bench Type Air, 8" throat
Hanna Pedestal Type Air, 13" throat
Chicago Pneumatic, 24" throat

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No. 10 Pratt & Whitney Hand Mill. Mach.
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No. 3 LeBlond plain, vert. att., mtr. dr.
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16"x8' Hendey Lathe, qd. hd., q.c.g., box
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26"x10' Whitcomb Blaidsdell Lathe, q.c.g.
28"x14' Putnam Lathe
48"x20' Fitchburg Lathe

TURRET LATHES

No. 2 Millholland, 1½" bar feed
No. 5 Acme, 2½" cap., p. fd., bar feed
No. 6 Warner & Swasey, p. fd., bar feed
No. 4 B. & O., 1¼" cap., 2 p. fds., bar fds.
No. 7 B. & O., 2¼" cap., p. fd., bar feed
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2½" and 3½" Gisholts, 2 p. fds.
3x36 Jones & Lamson

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42" Colburn Bor. Mill, 12 spds., 2 hds., 2 gear box
52" Bullard, 2 hds.

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18" Gould & Eberhard Shaper, Dir. M.D.
24" Gould & Eberhard Shaper, Dir. M.D.
20" Steptoe Shaper, Dir. M.D.
Betts Planer, 36x36x12', 2 swiv. heads
Cincinnati Planer, 60x60x10', 3 hds.
Woodw. & Pow. Planer, 36x36x12', 3 hds.

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12x36" Cinc. Grinder, univ., p. fds. thru gear box
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6x18" Fraser univ., p. fds.
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No. 75 Heald Internal Grinder

New 6x18" Surface Grinders, motor in base

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Toledo, 5" stroke, b. grd.
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1½" capacity 1 and 2 Spindles. Motor Drive.

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Nos. 24 & 34 New Britain Auto. Chkg. Machines, m.d. (6)
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21" Cinc. Bick., Box col., Prod., m.d. & m., pwr. fd. to spdl., two Buhr adj. heads
3' Western Radial
Fox. Mult. spdl., with tapp. att. (3)
No. 121, 2 spdl. Bakers, rotary tables, m.d. (3)
Kingsbury 4 spdls., with auto. index. device

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No. 36ST Gould & Eberhardt Gear Gasher
No. 5A Lees Bradner Hobs (3)
Williams & White, 96" dia. x 52" face
No. 3 B & S Gear Cutter (2)

GRINDERS

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No. 2 Diamond Auto. Surface Grinder
No. 3 Brown & Sh. Universal Grinder

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No. 55 Heald Int., No. 60 20" Badger Face, hyd. feeds, 44" travel, m.d.
No. 1 Osterholm Face
No. 126 Gardner double spindle, hyd. feed
No. 6 and 20 Bryant Int. (4)
16"x36" Cinc. Plain Cyl.
12"x36" Landis Pl. Cyl., m.d.
10"x24" Norton Pl. Cyl., m.d.

LATHES

Clark Production
16"x8' L. & S. pat. hd.
16"x6' Hendey q. c. q., m.d.
16"x12' Lodge & Shipley

24"x16' Prentice grd. hd.
36"x16' Hamilton grd. hd., m.d.
28"x8' Chard, qc, t.a.
26"x14' Walcott, q.c., t.a.
40"x18' Johnson

LATHES—TURRET & PRODUCTION

5A Pot. & Johns., m.d. (2)
34"x11' Wickes Crkshft., (2)
18" Acme, 1½" cap. (2)
3"x36" J & L, bar equip.

3¼"x36" Acme, grd. head

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Binsee 3¾" horiz. bor.
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150 KW Federal, m.d.
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SHAPER, 24" Rockford, m. d.

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SAW, 36" Newton, cold cutting, motor drive.

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Bement Miles 4" Bar Floor Type Horiz.
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Bryant Nos. 6, 10A, 18A, S-A. 2 Sp. Hole, No. 40 Chuck
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Diamond No. 1 Surface
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Hendey Lathes—most sizes
Prentice 16"x6', 18"x8'—G.H.
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Pittsburgh 32"x24', g.c.g.
Lo-Swing 4"x36", 4"x60", 4" & 8"x108"

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Becker No. 3, No. 4 and No. 5B Vertical
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No. 44 Productomatic
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P. & W. 5" Automatic
Brown & Sharpe No. 10 & No. 12 Production

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W-F 30 Ton Cap. Rack & Pinion, for shells
West 36" Double Crank Gd.

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Cleve. ⅜", ½", ¾", ⅞", 1", 2", 2½", 2¾" Auto.
Potter & Johnston Nos. 5A, 6A Chuckers
New Britain No. 22, 23, 24 Chuckers
Goss & DeLeeuw 6"x6½" M.D. Chuckers

MISCELLANEOUS
Broaches, LaPointe 1-2-3
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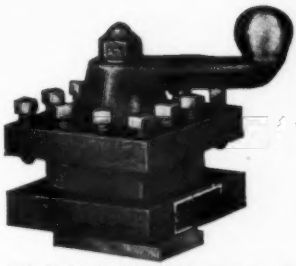
Thousands of satisfied dealers and users repeat orders attest to the high standards which govern the manufacture of these high grade tools.

These tool post turrets are firmly held in position by an integral key which is tailored to fit compound rest on your particular lathe. Held down by a nickel alloy steel stud tapped into a "T" nut in the compound rest slot. A hardened acorn nut on top permits tightening rigidly.

We do not recommend the use of tool holders, but prefer tool bits held directly in slot of turret for maximum rigidity.

Any Turret may be milled to fit square on lathe when compound rest is at 30° or 45° at regular prices.



Model "31" Tool Post Turret

Model "61"

Eight position indexing, of massive proportions, making this model adaptable for lathes up to 24-inch swing. Custom built to your requirements.

Block is 5¾ inches square. Hardened alloy steel (48 Rockwell C). Holding screws ½-inch-13-inch, hardened.

Weight, approximately 35 lbs.

Price $99.00 Prepaid

Model "41"

Adaptable for use on Lathes up to 16-inch swing. Four position indexing, or may be had in eight positions at an optional charge of $3.00.

Block 4 inches square, case hardened steel, mottled finish. Holding screws ⅜-inch by 16-inch, hardened.

Takes tool steel ¾ inches square or smaller, by the use of shims.

Weight, approximately 15 lbs.

Price $49.50 Prepaid

Model "31"

Made especially for Bench Lathes and small Engine Lathes up to 12-inch swing, and are widely used on Hand Screw Machines. Block 3 inches square, case hardened, mottled finish.

Four position indexing, or may be had in eight positions at an optional charge of $3.00.

Made to use tool steel ¾ inches square or smaller, by employing shims.

Weight, approximately 5 lbs.

Price $25.00 Prepaid

INSTRUCTIONS FOR ORDERING TOOL POST TURRETS

MAKE OF LATHE.....
SWING OF LATHE.....

Model "61"

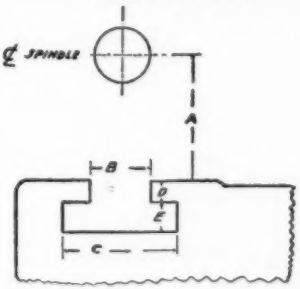
Specify size of tool bits to be used. Supply dimensions required in cut.

Model "41"

Supply dimensions required. If dimension "A" is over 2⅛ inches add $3.00 to price. If dimension "A" is less than 1-7/16-inch specify Model 31. For eight position indexing, please specify and add $3.00 to price.

Model "31"

Supply dimensions required. If dimension "A" is over 1⅜ inches add $3.00 to price, or specify Model 41. For eight position, please specify and add $3.00 to price.



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4' Western Mfg. Type, Plain Radial, M.D.
No. 1 Leland Gif. Bench, Tap. Att.
1 Sp. Allen, P.F. & T.A.
4 Spdl. Henry Wright
2 Spdle. Avey H.S. B.B. No. 2 M. T.
1 & 2 Sp. Demco, H.S. B.B.
24" Hoeffer Sldg. Head, Tap. Att.
No. 13 Natco, 16 Spindles
No. 22 Natco Multiple 24 Spdl.
Rec. Head, 12½"x31" area
No. 3 Avey, high speed 12" overhang No. 3 M.T.

LATHES

14"x10' Hendey Q.C.G., T.A.
16"x8' Greaves Klusman Grd. Hd., Q.C.G.
24"x10' L. & S. Q.C.G., B.G.
24"x16' So. Bend Std. C. G. Tap. Att.

LATHES, TURRET

No. 1 Foster Hand
24" Steinle, 6¼" Hole Thru Spdl.
No. 2A W. & S. Univ. Hol. Hex. Turret Bar Fd. & Ckg. Eqpt. Mult. Vee Belt M.D.
3⅜" Collet Cap.

GRINDERS

No. 3 Wil. & Mor. Auto. Surf. 8x24" Cap.
No. 23 Baxter D. Whit. Int.
No. 2 Lucas Auto. Surf., M.D.
Bristol Rotary Surf., 11½" Dia. Mag. Ck.
7½ HP U. S. Snagging
No. 11 G & L Teromatic Int. M.D.

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No. 5C Becker Vert. S.P.D. Thru Gr. Box
6"x48" Pratt & Whit. Thread
No. 2 P & W Hand
No. 2 LeBlond Univ. B.G. Cone Hd.
No. 3A B&S Grd. Hd. Univ. Sgl. Ply. M.D.
No. 3S Cinn. Plain Std. Grd. Hd. M.D.
No. 0 G & S Vert. Mill & Jig Borer, M.D. New

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No. 50-4-36, Minster, S.S. 56 Ton Cap. 4" Stroke. Flywheel Type.
No. 1 Bliss Cam, Fly

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16" G&E Back Geared Crank
20" Steptoe b.g. crank
24" G&E Back Geared Crank
25" S&M B.G. Cr., MD. gr. b.

SCREW MACH., AUTO.

No. 53 Acme 1" Cap. 4 Spdl. M.D.

MISCELLANEOUS

Broach, No. V-18 American
Die Filer, No. 5 Thiel, m.d.
Gear Cut., No. 3—26"—B&S
Planer, 32x32x8' American
Riv. Hmrs. Nos. 1½B, 3A H.D., 4A Mtr. Dr. & 5A High Speed
Scleroscopes, Mod. "D" Shore Record. Type, Swing, Stands.
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Saw, No. 1 Marvel Hack, 4x4 cap.
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1—No. 14 Brown & Sharpe (10 x 16") Heavy duty plain cylindrical grinder 3 motor drive, all automatic feeds, very modern tool, for wheel up to 23x3"
1—16x48" Cincinnati Universal grinder, 3 motor drive
2—12x36" Cincinnati Plain Cylindrical Grdrs., 3 motor dr., largest dia. of wheel 18"
1—No. 22 Heald rotary surface grinder 9", magnetic chuck
1—Arter Rotary surface grinder 8½" chuck, very modern tool
2—No. 80 Heald internal grinders, all power feeds
1—No. 6 Besley ring wheel grinder, dia. of wheels 18", width of table 6"

TURRET LATHES

1—3½"x26" double spindle Jones & Lamson flat turret lathe
1—3x36" single spindle Jones & Lamson turret lathe, arranged for bar work, with complete set of tools

MILLING MACHINES

1—model CS Becker vertical rotary mill, s.p.d. dia. of circular table 28½"
1—No. 3V Toledo vertical mill, s.p.d. all geared speeds and feeds, table 56"x14", range 46"x14"x16", with power rapid traverse

LATHES

3—9" Porter Cable Manufacturing Lathes, s.p.d.
1—36" heavy duty Springfield engine lathe, max. distance 8' 6"
1—12"x4' Hendey lathe

GEAR MACHINERY

1—No. 5 Lees Bradner gear generator, max. dia. of gear 4" in steel, in cast iron 8"

PLANERS

1—36"x36"x10' Niles Planer, four heads, belt drive
1—36"x36"x8' Woodward & Powell planer, two heads on rail

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AUTOMATICS
1—¾" cap Acme 4 spd. M.D.
1—2" Cap. Cleveland Mod. A
1—1" Cap. Cleveland Mod. A
No. 24 New Britain 4 spdl. chucking machine

BOLT THREADING MACHINES
2 spdl. 1" Cap. Landis
1 single spdl. 1½" Landis
2—1½" Acme

BORING MILLS—Vertical
48" Niles Bement & Pond Car Wheel Borer M.D.

DRILLS
1-5' Niles Bement & Pond gear Box S.P.D.
3½' Bickford Un.
2 and 4 spd. Henry & Wright
24" Barnes Camel back M.D.
36" Cinc. Bickford sld. hd.
36" Aurora Sl. Hd.
4 Spd. Barnes No. 4 Taper, 82"x17" Tbl p.f. to spd. m.d.
1—16 spd. Bosch M.D. oil grooved 54"x30" rect. head, No. 3 Morse Taper
4—Langelier Bench High Spd.
1—Demco S.S. High Speed

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3-3000 lb. Alliance
2-2000 lb. Morgan
1-1500 lb. Morgan
1-1000 lb. Morgan

GEAR MACHINERY
60" G and E Automatic Gear Cutter
1—3-26" B&S Auto. gear Cut.

GRINDERS
Hardinge Precision Tool Room
14x72 Landis Pl.
Oliver Drill
1—No. 65 Heald, cyl.
1—14x50 Lea Mt. Dr. 3 mts Un.
10x48 No. 14 B&S Pl.
8x36 Fitchburgh Pl.
12x36 Landis Pl.

LATHES
2-12x5 Cleveland G. Hd. Taper Attach.
16x8 Flather M.D.
17x8 South Bend C.P.D.
17x10 South Bend C.P.D.
2—18x8 Mueller, 3 step.D.B.G.
2—18x8 Morris, 3 step. D.B.G.
4x60 Fitchburg low swing—new condition
42x26 Bement Triple geared
12x5 Hendey Yoke hd. Tap.at.
20x8 Monarch 3 step D.B.G.
48x18 American Triple gear

PLANERS
60x60x18 Pond 4 hds. Rev. Mt. Dr.
30x30x8' New Haven

TURRET LATHES
No. 1 Bardons and Oliver
No. 2 Warner & Swasey
4" Conradson Un.
No. 6 Brown and Sharpe
2¼x26 Greenlee bar feed and auto. chuck
No. 4 Brown & Sharpe

MILLERS
2-Productomatic Milling Mchs.
No. 3 Cincinnati, Plain
No. 0 Van Norman hand
Hendey & Becker Lincoln Typ.
AB Becker Vert. Rotary Table, new condition
1-No. 3½ Fox Plain
2-E4 Kellar Auto. Die sinkers AC Mt. dr. Timken bearing spindles.

PRESSES
75½ Bliss Trimming Press
1-Billings & Spencer Trimming Press
2—No. 2 Standard O.B.I
2—No. 18 Bliss O.B.I.
2—19½ Bliss O.B.I.
4¾ Michigan O.B.I.
Toledo Arch G.M.D. No. 51
No. 37 Niagara back Flywheel M.D.
No. 5 Stiles & Parker geared
No. CG 14 Ferracute O.B.I. Automatic roll fd.
Robinson Tog. Press 125 Tons 75" between uprights, 15½" f to b, 3" stroke

PRESS BRAKES
No. 255 D & K 72"-16 ga. m.d.
10'x10 ga. George Ohl M. dr.
6'x10 ga. D & K Leaf Type md.

SHAPERS
20" Steptoe C.P.D.
26" Kelly M.D.
24' Milwaukee C.P.D.

WELDERS
50 K.W. Thompson Spot Auto. 60 cycle
35 K.W. Thompson Spot. Auto. 60 cycle
25 K.V.A. Thompson 25 cy. (3)
58 K.V.A. Thompson 25 cycle
20 K.W. Toledo 40 cycle
35 K.W. Thompson 25 cycle
25 K.W. Federal Butt Welder 25 cycle
45 K.W. Federal Butt Welder 25 cycle
8-200 AMP. Lincoln stable Arc Welders 25 cycle
1-G.E. 200 AMP. Arc Welder 25 cycle
1-150 AMP. Lincoln Shield Arc Welder 25 cycle

PIPE MACHINES
10" Cox
206 A Oster 6" Capacity
10" Bignall and Keeler M.D.
6" Stover M.D.
Acme & L. Bolt Thrd. Mchs.

SAWS
3" Burr Cold
No. 12 Higley Cold
No. 3 Klemm Metal Band Saw

MISCELLANEOUS
1"x96" Cap. Lennox Splitting Shear
3—Grant Spinners
3A High Speed Hammer
Morton Keyseater 4" cap.
No. 0-2-3 LaPointe Broaches
1—No. 1 Gray Nibbler Turret Type
6" Pilton Slotter
7" Rhodes M.D.
Wells Wire Straightener and Cut-off
⅝"x18' Nilson Wire Straightener and Cut-off

WOODWORKING MACHINERY
3 Drum Columbia Sander
Defiance single spdl. Boring Machine Mt. on spd.
Fay & Egan S. end Tenoner
6-Swing Cut-off saws
1-Automatic Glue Jointer
1-24" Oliver Jointer
1-No. 1 American Saw table
1-Smith Treadle Dado Saw tbl.
1-New Britain Chain Mortising Machine.
1-Friction feed Cut-off saw
1-Double end cut-off saw
2-No. 2½ American Dbl. Spdl. Shapers
Pettingell Saw Tenoning Mch.
2-Crescent Univ. Woodworkers

NESBITT MACHINERY CO.

110 E. PRATT STREET, BALTIMORE, MD.

100 MODERN
JUST PURCHASED!

PRESSES—DOUBLE CRANK

All Motor Driven—Tie Rod Frame

6—NO. 93½-F TOLEDO, 6" stroke; Area of bed 36"x66"

3—NO. 93-H TOLEDO, 12" stroke; Area of bed 42"x84"

2—NO. 93-E TOLEDO, 8" stroke; Area of bed 32"x60"

5—NO. 93½-E TOLEDO, 8" stroke; Area of bed 34"x60"

1—NO. 97-H TOLEDO, 10" stroke; Double geared; Max. pressure approx. 600 tons; Est. wgt. 245,000 lbs.

1—NO. 605½ HAMILTON, 8" stroke; Area of bed 33"x60"

2—NO. 4-A BLISS, 6" stroke; Area of bed 27x37"

3—NO. 166-D CONSOLIDATED; 12" stroke; Area of bed 36"x84"

1—NO. 158-B CLEVELAND, Straight Side, Tie rod, 5" stroke; 72½" bet.; 10" shaft

CLEARING CRANKLESS PRESS

TRIPLE ACTION, 4-POINT SUSPENSION TYPE

Combined Cap. Blankholder & Plunger Slide, 1350 tons

- **Bed 84'x133'**
- **All Steel Construction**
- **Self-Contained**
- **Motor Drive**
- **All Gears Enclosed Running in Oil**
- **All Drives and Ram Adjustments Operated from One Control Board**
- **Wgt. Approximately 518,000 lbs.**

Partial Listing of Items in Stock

GRINDERS

No. 132 Arter Automatic, Motor Driven
CYL. No. 12 Brown & Sharpe; 12"x42" Landis; 10"x24" Norton
SURFACE: Springfield Planer Type; 15"x15"x 8' Norton; No. 2 Diamond; No. 5 Abrasive, 48" mag. chuck, M.D.; No. 3 Wil. & Morman

MILLS

HORIZ. BORING: 12" Niles Cyl.; 2½" Cleveland; 3" Fosdick
PLAIN MILLS: No. 1-B Kearney & Trecker; Nos. 2 & 2½ Rockford; No. 25 Becker
PRODUCTION & PLANER: Ingersoll, 2 heads, table 30"x144"; No. 2 Kent Owens
THREAD: No. 3 Lees-Bradner; 6"x132" P & W
VERTICAL: Nos. 5, 5-C, 6 Becker; No. 2 B & S

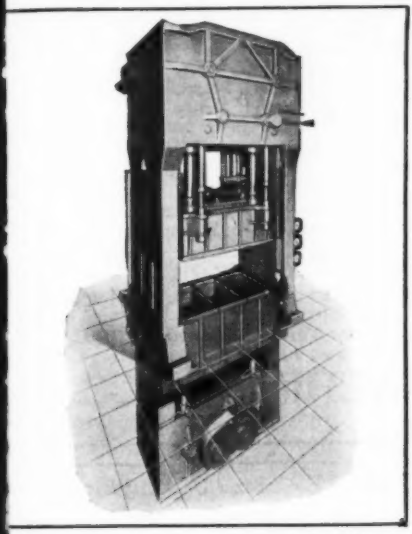
LATHES—FLOOR

36"x16 Ft. Bridgeford Geared Head Raising Blocks Increase Swing to 60"
36"x16" Ft. Schumacher & Boye
36"x30 Ft. New Haven Loose Change Gear Back Geared; 23'8" Between Centers
32"x16 Ft. Bridgeford Geared Head 110" Between Centers; Motor Drive
52"x22 Ft. Fifield Triple Back Geared
26"x9 Ft. Bridgeford, QCG.; Will Swing 27"; Motor Drive Less Motor
28"x48"x13 Ft. Harrington Gap
26/46"x20 Ft. Schumacher & Boye Double Spindle Back Geared; Cone Drive
24/44"x18 Ft. McCabe Double Spindle

INTERSTATE

LARGE PRESSES

ENROUTE TO WAREHOUSE!



PRESSES—TOGGLE

2—No. 408 BLISS, Double Crank, Tie Rod Frame, 84" Bet. Housings

1—No. 268¼ TOLEDO, Double Crank, Stroke of plunger slide 29"; Stroke blankholder slide 18"; Bed area 60"x 84"; Air Cushions

1—No. 268¼-C TOLEDO, Twin geared; Tie rod; 97" bet. housings; Wgt. approx. 200,000 lbs.

1—No. 409-D BLISS, 108" bet. upr.; Tie rod; Twin gd.; Air cushions; Plunger stroke 31"; Wgt. 215,000 lbs.

PRESSES—STRAIGHT SIDE

1—No. 59½ TOLEDO; Tie rod, 6" str.

1—No. 55 Toledo; 1—No. 73½ BLISS

PRESSES—O.B.I.

3—No. 8-1 Cleveland 6" Stroke

6—No. 5 & 5A Toledo 4" Stroke

4—No. 5 BLISS Consolidated, 4" stroke

2—No. 4 TOLEDO, 3" stroke

Send for Catalog 404

27"x16 Ft. Bridgeford Geared Head Lathe; 113" Between Centers

24"x10 Ft. American Geared Head 8 Speed Head; 26" Swing

24"x14 Ft. American Geared Head Will Swing 25"; Motor Drive

22"x16 Ft. Hamilton Geared Head

LATHES—TURRET

No. 3A Warner & Swasey; 28" Pond; 22" Libby; No. 5-A Potter & Johnston

New No. 4 Universal Turret Lathe; 20" Swing; Hardened Ways

ROLLER LEVELLERS

30", 50", 54", 56", 60" H & J. McKay

PLANERS

20' Niles Plate; 36"x36"x14' Detrick Harvey Openside; 36"x36"x8' Niles; 30"x30"x10' 26"x8' Cleveland Openside; 22"x20"x5' Pond; 30"x30"x10' Gray; 36"x36"x10' American

PRESS BRAKES

OHL: 10'10 ga.; 10'14 ga.; 6' 7/32"; 5' 14 ga.; CHICAGO STEEL: 54" 10 ga. Nos. 255 & 335

ROLLER DIE MACHINES

2, 3, 4, 5, 6, 7, & 8 spindle Yoder & McKinney

ROLLS—POWER

12'1¼" Wickes; 18" top roll; 13" bottom roll; Pyramid type; Motor Drive

10¾" Columbus; Belt Drive

Machinery Co., Inc.

1449 W. PERSHING RD., CHICAGO, ILL.

Niles 51" vert. Boring Mill, 2 heads
Leland-Gifford, 2-sp., power-feed, m.d., Drill Press
National Red Ring Gear Lapper, md.
Bethel Gear Lapper, No. 1-C-A, md.
Landis 14"x36" Grinder
Cincinnati No. 3 face mill Grinder
Univ. semi-auto. spline Grinders (2)
Modern 12"x48 Grinder
Lodge & S. 30"x16' g.h. Q.C. Lathe
Niles 24"x10' Q.C. heavy duty Lathe
South Bend 24"x12' L. C. Lathe
Lehmann 20"x12' Q.C. Lathe
Monarch 20"x12' Q.C. Lathe, taper attach.
South Bend 20"x10' L. C. Lathe
Cinc. 18"x8' Q C. Lathe, double b.gd.
Becker Production Miller
Kempsmith No. 33 Prod. Mill, s.p.d.
Steptoe No. 0 Mill, power-feed
Bickett 52"x12' Planer, m.d.
American 36x36x10 Planer, 2 heads
Ohio 36x36x10 Planer, 1 head on rail, 1 side head
Woodward & Powell 30x30x8 Planer
American 22x22x5 Planer
Bliss Consolidated Press, 3½" stroke
Kling No. 4 Single End Punch, 15" throat, gd.
Williams & White No. 13 Single End Punch, 36", gd.
New Doty No. 17-B Sgl. End Punch
Western 3' Radial Drills (2)
Amer. 3' Rad. Drill, 9" round column
Western 5' Radial Drill
Kling 8' pyr. Rolls, 10" top, 8" bottom, ½" cap.
Fellows No. 61 Gear Shaper
G. & E. 20" Shaper, back geared
Fellows No. 4-T Thread Generator
Landis 1" dbl. hd. Thrdr., lead screw
Libby 26" Turret Lathe, 4½" hole through spindle, s.p.d.
Prentice Turret Lathe, gd. hd., Q.C., hexagon turret

F. W. BURNS MACHINERY CO.

1441 NORTH THIRD STREET, MILWAUKEE, WIS.

IF WHAT YOU WANT ISN'T HERE

Send Us Your Inquiry

BRAKES:
8'—18 ga. Chicago Steel, New and used

DRILLS:
Hisey Wolf No. 26 Electric ¼" $42.50
Van Dorn, 1¼" Electric 110 V. $50.00
Radial, Sens, 3 ft. American
Radial 6 ft. American Half Univ.
No. 3 Baush, 20-spdl.
Rail, No. 2 Foote-Burt 4-spindle
Prentice, 4-spdl. high-speed
Allen BB Type B sgl. spdl.
Allen 3-spdl., BB., cap. 1"
Dwight-Slate 7 Spdl. ¼" cap.
Demco DAH ½" bb, M.D.
14" U. S. $35.00
20" Barnes B. G. & P. F.
20" Barnes, camel-back
25" Bickford, sl. hd. BG & PF.
28" Hamilton sl. hd. BG & PF.

GRINDERS:
Disc, No. 6-20 Besly Dbl. Spdl.
Disc, No. 220 Badger & press
Drill, New Yankee, D.E.
Elec., Hisey-Wolf 3-6 BOA BB
Flex. shaft, RA 5 Haskins
Emery, DE, Norton 24"
Emery, DE St. Louis 18"&20"
Internal, Madison:
Surface, No. 1 La Salle
Tool Post, U.S. Style HA $47.50
Wet tool, Springfield, 27" wheel

LATHES:
26"x14' Niles, PCG
20"x8' Bradford, PCG MD.
18"x8' Rahn & Mayer PCG
14"x6' Rumsey, PCG
10"x42" Atlas, bench type, No. H-42, 1/3 HP. 110 V motor

LATHES—Turret:
2x24" Jones & Lamson
12" Reed-Prentice BG

PRESSES:
Arbor, Famco and Atlas.
Arch, Bliss 30-A Grd., M.D.
Cam Drawing, 69-N Bliss
Foot, Famco and No. 4 Swaine
No. 2 L. & J. O.B.I., New (2)
Punch, No. 5 Bliss Stiles Grd.
No. 20 Excelsior 1" in 1"

PUNCHES & SHEARS:
SE, Cleveland C ¾ in ¾", 26" thr.
SE W.W 14½, 25" thr. 1 in 1"
Rock River L, 24" thr. ½ in ½"
DE 1-10 Badger ½ in ½", 10" thr.

SAWS:
Cold, Higley, 20" saw, No. 17
Cold, Higley, 18" saw, No. 14
Hack, No. 3 Robertson 6x6"
Hack, No. 14 Atkins 6x6"
Wells No. 5 & 8, Band, Metal new

SHAPERS:
20" Hendy planer type dr.

SHEARS:
Dbl. action, No. 11 Excelsior, inside cutting, cap. 12 ga.
Rotary Bevel, Lennox ¾"
Slitting, Rotary Niag., cap. ¼" Throat 16"
Square, 36"x18 ga. Pexto Foot, New (3)
Square, 30"x18 ga. Ditto
No. 254 Pexto 30" Gang Slitting 20 ga.
No. 1236 Libert, 12 ga. 36" throat M.D. (New)
Throatless, 18 H Marshalltown

THREADERS, Pipe & Bolt:
Murchey, ¾" dbl. head, bolt
Pipe, 2" Oster No. 302
Pipe, 4" 2-A Williams

MISCELLANEOUS:
Dbl. Seamer, Swaine, 36" cap.
Chucks, Lathe 4-jaw Ind. 8" to 16"
Compressor, Herron-Bury CCB, 14x9x8", 6' tank, 20 HP mtr.
Hammer, 50-lb. Little Giant.
Jacks, Lever Lift, 15 ton Joyce-Gridland; Simplex; 10-ton Barrett
Planer, 30"x30"x8' Wheeler
Roll, Corrugating, 10' Robinson
Welders 2½, 5, 7½, 10 K W Dyer spot
Valve Refacer, ½" Black & Decker

Brown Mchy. Co., 2333 N. Ninth St., St. Louis, Mo.

AUTOMATICS

¼"-¾" Cleveland Model A
1¼" Cleveland Model B
2¼"-3¼" Cleveland Model A
No. 34 New Britain Chuck
No. 6A Potter & Johnstons (2)

BORING MILLS, Vertical

36" Bullard Rapid Pro.
42" N.B.P. Car Wheel Borer
10'-16' Niles Ext. Type M.D.
72" Niles, 2 hds., M.D.

DRILLS, Radial

5' Cinc. Bickford Gear Box, MD.
4' Dreses Plain
6 spin. Henry & Wright Sensi.
5 spin. Henry & Wright Sensi.
4 spin. Allen, Sensitive
1 spindle Sensitive
No. 11 Natco, 8 spin.
20" Sibley Upright
No. 13 P. & W. Multi
No. 13 Natco Multi.
22½" Barnes Upright
No. 1½ Avey 7½", B.B.
Baker Type M. Tapping
Bausch No. 30 Multi spin. 30" round head 8 spin.

GRINDERS

No. 51 Oliver, 3" Twist Drill, M.D.
6"x20" Landis, Hyd. Feed
10"x6"x36" Norton Opns., Surf., M.D., 10"x40" chuck
No. 10 Bryant Chucking
No. 6 Landis Cyl. Grinder
No. 2 Churchill Internal
12"x36" Diamond Surface No. 2 with 12"x33" magnetic chuck
18" Besly No. 26 Disc
20"x8" Hamilton, Grd. Hd.
20"x96" Landis Cyl. M. D.
20'-96" Landis Univ.
24"x 96" Landis Cyl. M. D.
30" x 240" Landis Roll M. D.
No. 55, 60 and 65 Heald Cyl.
90" Bridgeport Shear Knife
3 HP Black, Decker emery M.D., 3/25/220
24" Blount Snagging
Wilmarth & Marmon Twist Drill, M.D.

LATHES

14"x8' Hendey, T.A. Cone M.D.
20"x8' L. & S., Grd. Hd., M.D.

LATHES (Continued)

20"x12' L. & S., Grd. Hd., MD.
21"x8' Ryerson Grd. Hd.
22"/24"x12' L. & S., Q.C.G., M.D.
24"x10' L. & S., Grd. Hd., MD.
24"x12' Putnam Grd. Hd., M.D.
24"x15' N.B.P. Q.C.G., T.A.
24"x20' Lodge & Shipley QCG.
26"/48"x12' Harrington, Gap
26"x11' Wickes Heavy Cone
28"x16' Pond, L. C. G.
30"x16' N.B.P. Axle & Journal, Center Drive, M.D.
30"x28' N.B.P. Gun Boring
32"x16' Schumacher Boye
36"x14' Rahn Larmon, Q.C.G., Cone
36"x16' Putnam Tri Grd.
36"x25' Pond, 2 carr., Tri. Grd.
36"x27' Gleason, F. Plate Dr.
42" N.B.P. Center Dr. Whl.
90" N.B.P. Heavy, Wheel
Peerless Banding Lathe, M.D.

MILLERS

36" Bliss Vert. or Die Sinker
Nos. 2 & 3 P. & W. Die Sinkers
No. 2 Cinci. Pl. Cone M.D.
No. 3 Newt. Miller, 30"x30"x6'
No. 6 Whitney Hand
No. 33 Kempsmith, Mfg.
28" Cincinnati Semi Auto
42"x42"x8' Bement Pond, Adj. Rail Miller, 4 hds., hd.
No. 6 Jackson Die Sinkers (3)
No. 1 Standard Hand
No. 1 U.S. Hand, new

PLANERS

72"x72"x16' Cincinnati, 4 hds.
60"x60"x30' Gray, 4 hds., reversing motor drive with motor
36"x36"x12' D. & H. Openside
26"x26"x8' Gray
24"x24"x12' American
24"x24"x8' Chandler, 1 hd.
24"x24"x6' Pond 1 hd.

TURRET LATHES

3"x36" J. & L., Chucking
Double Spin. J. & L.
21"x26" P. & W. Grd. Hd.
No. 6 Brown & Sharpe, Screw
24" Davis
24" Gisholt, 6½" h.s., T.A. (3)
24" Steinle M.D. 6½", h.s., (4)
28" Steinle M.D. 8½", h.s.
No. 6A Potter & Johnstons (2)

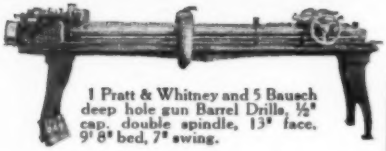
MISCELLANEOUS

Bolt Threader, 1"—1¼" Landis M.D. double hd.
Bolt Threader, 2" Landis
Bolt Threader, 1¼" Landis
Broach, No. 3 Lapointe
Chucking, No. 34 New Brit.
Die Sinkers, No. 6 Jackson (3)
Flanger, ¼" McCabe Pneu.
Gear Cutters, 100", 84" & 60" Gould & Eberhardt, Spur (3)
Gear Gen., 18" Gleason Bevel
Gear Shaper, No. 6 Fellows md.
Hammer, 70 lb. Scranton, Power
Hammers, 1500 lb., 1200 lb., 600 lb., McDougall & Potter, steam or air forging
Header, 1¼" Acme Rivet
Hobber, 8" Hercules
Jarring Mach., Herman Jolt Mould
Keystr., No. 6 Catlin, 40" stroke up to 5" wide
Keystrs., Nos. 1 & 3 Bakers
Keystr., No. 4 M & M, M.D.
Lapper, Norton Type 1C
Oil Groover, No. 1 Garvin
Pipe Machine, 12" Saunders
Pipe Mach., 12" Curtis & C.
Pipe Machs. 3" Stover M.D.
Pipe Machine, 2" Saunders
Press, No. 3A Bliss, Dble. Ck.
Press, No. 61 Spec. V. & O.
Press, 1000 ton Watson Stillman Horiz. Hyd. Forcing
Press, 400 ton N.B.P., 96" Horiz., Hyd., Loco. wheels
Press, No. 58 Perkins S.S. Grd.
Punch 54" H & J No. 2 D.E.
Punch & S., No. 91, Size 11 Smith, coping attachment
Punch & S., No. 20 Schatz Type
Rolls, 12' Corrugating—Heavy
Rotary Table, 28" diameter
Saw, 6" Gorton No. 2B Inter.
Saw, 10" Espen Lucas Cold
Saw, 10" Nutter Barnes Cold
Saw, No. 2B Cochrane Bly 6"
Saw, No. 15 Lea Simplex
Shaper, 24" Queen City, M.D.
Shaper, 24" Cincinnati
Shaper, 36" Morton, railroad
Slotter, 10" Betts, Cone or M.D.
Slotter, 19" Putnam, heavy
Slotter, 24" Bement, M.D.
Slotter, 48" N.B.P., Grd., M.D.
Testing Mch., 100,000 lb. Riehle
Wire Straightener, 1" Shuster, 20'

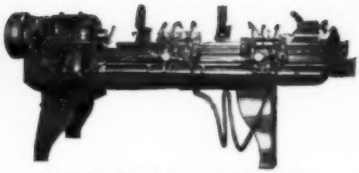
BENNETT & RAFKIN CO.

Offices: 30 CHURCH ST., NEW YORK CITY

SIX GUN BARREL DRILLS

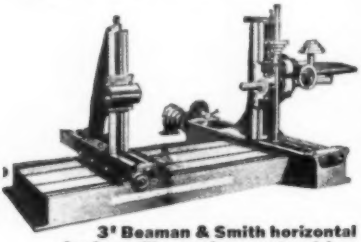


1 Pratt & Whitney and 5 Bausch deep hole gun Barrel Drills, ½" cap., double spindle, 13' face, 9' 8" bed, 7" swing.



3½"x60' Fitchburg, 1 Carriage

RADIAL DRILL, 3½' Mueller, T. A., oil grooved base, gear box, with table.
GRINDERS, 10"x24" & 10"x36" Norton Cyl., M. D.



3' Beaman & Smith horizontal boring mill, gear box, motor drive.

GLOBE
MACHINERY CO.
604 W. LAKE ST.
CHICAGO

GRAY PLANER; 36"x36"x16' 6" bed, 2 heads on rail, pulley drive.

FOR SALE
AUTOMATICS

Machines now operating but will be ready for shipment this month

2—2¼" Single Spindle Gridleys
2— ¾" Four Spindle Gridleys
1— ⅞" Four Spindle Gridley, motor driven, completely rebuilt by Modern in November
2—3¼" Single Spindle Gridleys
2—⅝-⅞" Single Spdle. Clevelands, completely rebuilt
2—⅜-½" Single Spdle. Clevelands, completely rebuilt

Including large number of collets, cams, tool holders, tools, belts and countershafts.

Only interested in selling complete in one lot $22,500.00, "as is, where is."

PITTSBURGH DUBOIS CO.

DUBOIS, PENNSYLVANIA

REBUILT & GUARANTEED MACHINES

List of machine tools in stock which can be rebuilt to your specifications.

GEAR CUTTERS:
36" G & E Auto. Gear Cutters
60" G & E Auto. Gear Cutters
72" G & E Auto. Gear Cutters
No. 12 Barber-Colman Hobbers

GRINDERS:
20"x96" Landis Cyl. Motor Drive
24"x96" Landis Cyl. Motor Drive
30"x240" Landis Cyl. Motor Drive

ENGINE LATHES:
36"x25' Pond, 2-Carriages
36"x27' Gleason Belt or Motor Drive

MILLERS:
No. 12 B & Sh. Manufacturing (2)
24" Cincinnati Automatics (3)
28" Cincinnati Semi-Automatics (3)
No. 2-V Potter & Johnson Vertical
37"x37"x14' Ingersoll Horiz. Spindle
24" Cincinnati Duplex Automatic (1)
9" Spindle Ingersoll Horiz. Fac. Mill

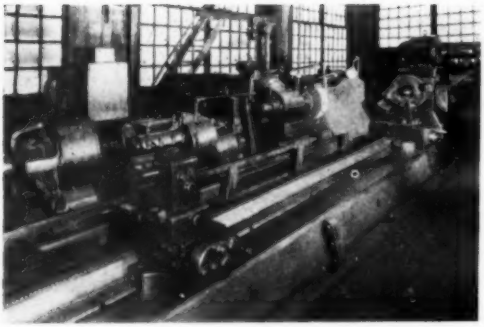
PLANERS:
1-30"x30"x12' Whitcomb, 2-heads
1-36"x36"x12' Betts, 4-heads
1-36"x36"x16' Niles, 4-heads
2-42"x42"x12' Cincinnati, 2-heads
3-42"x42"x12' Pond, 2-heads
1-42"x42"x16' NBP, 3-heads
1-47"x40"x12' Gray, 2-heads
1-48"x48"x16' Putnam, 3-heads
1-60"x60"x18' Niles, 4-heads
1-72" Morton Portable Planer

NEW MACHINES — IMMEDIATE SHIPMENT
6"x18" Surface Grinders—PRECISION TYPE
12" Slotters—Dual Control, Motor in Base
6"x24" Atlantic Hand Millers

Excellent facilities for rebuilding of large machine tools.
We solicit the rebuilding and modernization of your own tools.

ATLANTIC MACHINERY CORPORATION

149 Broadway, New York City **Telephone: WOrth 2-0662**



50" x 28' NORTON ROLL GRINDER

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CAN BE INSPECTED UNDER POWER

AARON MACHINERY CO.

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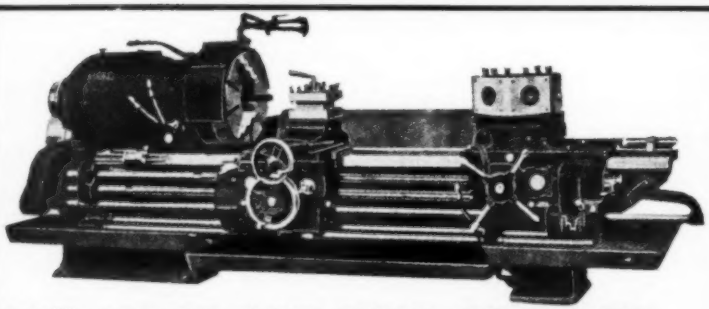


26" LIBBY "C" HIGH POWERED TURRET LATHE

A. C. MOTOR DRIVEN TOOLING EQUIPMENT.

WANTED — MACHINERY

There is an urgent demand for practically all types of machines.
Send us a list of your idle machinery.
PROMPT, COURTEOUS ATTENTION.

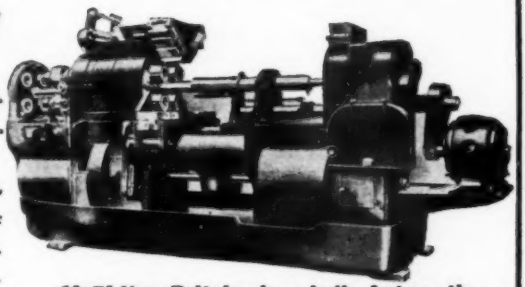
FRYE MACHINERY SALES CO.

549 W. RANDOLPH ST., CHICAGO, ILL.

SCREW MACHINES

HAND SCREW MACHINES

1—No. 1 W. & S., ⅝" cap. bar feed, M.D.
3—No. 1 Foster, ⅝" cap. bar feed, M.D.
2—No. 2 Pratt & Whit., 1" cap. bar feed, M.D.
6—No. 2 Warner & Swasey, 1" cap. bar feed, M.D.
5—No. 2 Foster, 1" cap. bar feed, M.D.
1—No. 3 B. & O., 1¼" cap. bar feed, M.D.
1—No. 3 Wood tilted (chucker) M.D.
2—No. 3 Foster, 1¼" cap. timken, bar feed, M.D.
2—No. 4 Milholland G. F. H. —P.F. 1½" cap. bar, md.
3—No. 4 Bardon & O., GFH. —P.F. 1½" cap. bar, md.
12—No. 4 Warner & Swasey, G.F.H. — P.F. 1½" cap. bar, M.D.
1—No. 4H Milholland G. H. timken, 1¾" cap. bar, M.D.
1—No. 5 Pratt & Whit., G.F. H. semi-univ. bar, M.D.
1—No. 6 Cincinnati Acme, G.F.H. — P.F. bar, M.D. 2¼" cap
2—4¼"x24" Steinle G.H. (chucker) M.D.
1—4½"x26" Model C Libby (chucker) M.D.



1"x5' New Britain six spindle Automatic Screw Machine.

AUTOMATIC SCREW MACHINES

1—No. 00G Brown & Sharpe, Ser. No. 9002, H.S.-M.D.
1—No. 00 Brown & Sharpe, Ser. No. 180
1—No. 2 Brown & Sharpe, Ser. No. 5100 plus M.D.
1—No. 2G Brown & Sharpe, Ser. No. 2225 M.D.
1—9/16" Davenport 5-sp. automatics, M.D.
1—1" Cleveland Model M, M.D.
2—1½" Cleveland Model M, M.D.
2—No. 55 National Acme 4-sp., 1¾" cap. S.P.D.
5—1"x5" New Britain 6-sp. (chuckers) M.D.
2—No. 24 New Britain (chuckers) 1½" cap. M.D.
1—No. 454 New Britain 4-sp. (chucker) M.D.
1—No. 652 New Britain 6-sp. (chucker) M.D.
1—2½" Model B Cleveland single spindle
2—4" Model B National Acme, bar, M.D.
1—4½" Model H Gridley 4-sp. (chucker) M.D.

No. 4 Warner & Swasey Turret Lathe with power feed to turret.

652 W. Lake St. LAKE MACHINERY CO. Chicago, Illinois

GENERAL LIST

GRINDERS

No. 12 Brown & Sharpe Plain Cylindrical
No. 2 Landis Universal Cylindrical
12"x36" Cincinnati Univ. Cyl., 3 Motors
8" Heald Rotary Surface, 2 Motors

RADIALS

1—5' American, single pulley drive

SHAPERS

30" Ohio

LATHES

7"x32" Pratt & Whitney Bench
14"x6' Hendey Geared Hd., single pul. dr.
16"x10' Bradford Geared Hd., Motor Dr.
18"x8' Sidney Quick Change Gears
20"x8' LeBlond Quick Change Gears
22"x10' Whitcomb-Blaisdell Quick Ch. Gr.

MILLING MACHINES

No. 2-A Becker Vertical, Motor Drive
No. 2 Brown & Sharpe Universal

GEAR CUTTERS

18" Gleason Straight Bevel Gear Gen.
No. 00 Pfauter Gear Hobber

AUTOMATICS

Acme ¾" Four Spindle

TURRET LATHES

No. 4 Bardons & Oliver
24" Gisholt, Spindle Hole 2½", pwr. fd.
22" Gisholt, Spindle Hole 3¼", pwr. fd.
24" Gisholt, Spindle Hole 6¼", pwr. fd., Motor Drive
No. 0 Brown & Sharpe

SAWING MACHINES

No. 6 Cochrane-Bly Metal Saw
No. 11 Cochrane-Bly Saw Sharp. Machine

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D-31 Fox multiple drill, rectangular head, 16"x31½" spindle centers. No. 2 Morse taper; 10 spindles, hand and power feed to head.

DIES and MACHINES for rect. cans, inc. 61 Ams flanger; 72 Ams double seamer; 126CD Adriance double seamer; 281 Adriance gang slitter; No. 114 Adriance Automatic Double Seamer 10' round cans.

DRILLS, 36" Cincinnati, back geared sliding head, tapping attachment; No. 4 Quint six spindle turret drill; No. 4 Morse tapers

HAMMER, 300 lb. Standard Auto.

ENGINE LATHES, One 9"x20" Porter Cable Production lathes with back facing attachment

GRINDER, 12x36 Modern Self Cont. Plain

HAMMERS, 60 lb. Bradley Helve; Drop Hammer, 300 lb. Standard Automatic

MILLING MACHINES, No. 2 Clough, vertical mill; No. 1 Newton slab, 65" table feed

TAPPING MACHINE, Automatic No. 2X Garvin

TURRET & MONITOR LATHES, No. 1 Am. Tool & Mach., Fox Monitor chasing bar

PLANERS, 24"x6' Pond, one head

PIPE MACHINES, 3" Bignall & Keeler; 4" Saunders; both belt drive.

PRESSES, One No. 40 Bliss horn

SAND BLAST, C-36 New Haven 36"x44" Radial Sand Blast Barrel M.D.

SEPARATOR, Large Oil Separator, with hoist; 3 McKenzie chip production

WIRE STRAIGHTENER, ¼" Shuster, 10 ft. Cutoff

Many other tools—exceptional "buys"—write for full details.

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Established 1894

HIGH SPEED
STRAIGHT SHANK TWIST DRILLS
Jobbers or Short Length

Size Inches	Our Price Per Dozen High Speed	Length Overall Inches
1/16	$ 1.80	2½
5/64	1.86	2⅝
3/32	1.92	2¾
7/64	2.04	2⅞
1/8	2.16	3
9/64	2.34	3⅛
5/32	2.52	3¼
11/64	2.70	3⅜
3/16	2.91	3½
13/64	3.15	3⅝
7/32	3.45	3¾
15/64	3.75	3⅞
1/4	4.05	4
17/64	4.50	4⅛
9/32	4.95	4¼
19/64	5.40	4⅜
5/16	5.85	4½
21/64	6.45	4⅝
11/32	7.05	4¾
23/64	7.65	4⅞
3/8	8.25	5
25/64	9.00	5⅛
13/32	9.75	5¼
27/64	10.50	5⅜
7/16	11.25	5½
29/64	12.00	5⅝
15/32	12.75	5¾
31/64	13.65	5⅞
1/2	14.55	6

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VICTOR MACHINERY EXCHANGE, INC.

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1 No. 84 Gardner Opposed Disc
2 No. 65 Heald Grinders
1 No. 6 Besly Disc
1 No. 14 Brown and Sharpe Grinder
1 Greenfield Cutter Grinder
2 24" Steinle Turret Lathes
3B Foster Turret Lathes
1 No. 4H Millholland Turret Lathe
4 No. 4 Warner & Swasey Turret Lathes
1 17"x8' LeBlond Engine Lathe
1 28" Gisholt Turret Lathe
1 28"x10' New Haven Engine Lathe
1 17"x8' LeBlond Production Lathe
4 25"x12' Le Blond Heavy Duty GH Prod. Lathes
2 25"x14' Le Blond Heavy Duty GH Prod. Lathes
1 14"x6' Reed Prentice Geared Hd. Lathe
1 14"x19" Fay Automatic Lathe
1 36" Cincinnati Horizontal Borer
1 3-¾" Barrett Horizontal Boring Mill
1 4" Niles Horizontal Boring Mill
2 No. 3 LaPointe Broaches
No. 3½L LaPointe Hyd. Broaches (new)
1 24"x24"x6' Ingersoll Slab Mill
1 No. 3 Becker Plain Mill
1 2½' American Radial Drill
1 5' Niles Radial Drill
1 2½' Fosdick Radial
1 D2 Colburn Drill
1 5½B High Speed Hammer
1 2A High Speed Hammer
1 5A Lees Bradner Gear Hobber
100 2, 3 and 4 Ton Chain Hoists
4 1"x5" New Britain 6 Spindle
1 No. 652 New Britain
1 No. 2 Brown & Sharpe Hand
1 No. 0 Brown & Sharpe Hand
1 20" Rockford Shaper
1 36" Fellows Gear Shaper
1 1F Norton Lapper
1 4" Ajax Upsetter
1 No. 0 Ajax Forging Roll
2 Ajax Rivet Headers
1 48"x48"x16' Pond Planer
1 No. 2 Garvin Tapper
1 100,000 lb. Riehle Testing Machine
2 275 Ton Hydraulic Presses, 4 post type
1 4½" Model H Gridley Chucking Mch.
1 No. 454 New Britain Chucker

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10,000 New Stacking Boxes

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Well constructed

$1.65 each, F.O.B. Chicago

24"x15"x7½"—18 gauge. Drop handles both ends. Lots of 25 or more.

PASSMAN BROTHERS
1101 W. Lake St., Chicago, Ill.

Ridgeway 74"x74"x32' Planer
Detrick & Harvey 42"x42"x10' Planer Opens.
Cleveland 42"x42"x18' Closed Side Planer
Universal Milling Machine: No. 2 Cincinnati
Milling Machine: No. 3 Cincinnati Plain
Milling Machine: No. 4 Becker Vertical
Turret Lathes: No. 2 Warner & Swasey (3)
Turret Lathe: No. 3 Warner & Swasey
Turret Lathe: No. 6 Warner & Swasey
Turret Lathe: No. 4
Lathe: 18"x8' Monarch, Q.C., back geared
Lathe: 16"x6' Hendey, Q.C., yoke head
Lathe: 16"x10' Whitcomb Blaisdell, Q.C.
Engine Lathe: 12"x6' W.C. Young, B.G., Q.C.
Radial Drill: 4' Universal
Press: Power, Bliss No. 0, Stiles, C.B.
Press: Power, Bliss No. 4, Stiles, C.B.
Shapers: 24", 20", 16", G. & E.
Shaper: 20" Steptoe
Cyl. Grinders: No. 3 Modern Universal (8)
Universal Grinder: No. 2 Bath
Gear Cutter: No. 6B. & S. 60"

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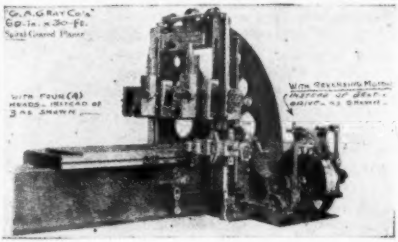
We CAN get some Tools —and GOOD Tools too— like these few illustrated—

43 years' experience in the Used Machinery business—has built up a Machinery organization to LOCATE NOW and place in operation available Used Machine Tools and Equipment and increase production on our War and Victory programs, your list to us wanted of Machinery—for Sale—or Wanted.

Various Sizes of other Lathes: Planers; Turret Lathes; Shapers; Saws; Grinders; Multiple, Upright and Radial Drills, Keyseaters.

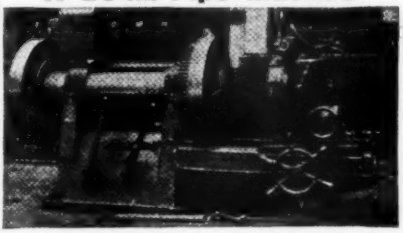
RAILROAD, PLATE-SHOP TOOLS, ETC. ALL LISTED IN TEN PAGE BIG BROADSIDE BULLETIN NOW OFF THE PRESS.

A 60-in. x 30-ft. Planer



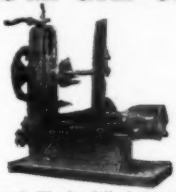
60-in. wide planer—capacity 60-in. high, table 30 ft. in length. "G. A. Gray Co.'s" four heads with reversing motor drive instead of belt driven as shown above.

A 10-in. Pipe Machine



"Standard Engineering Co.'s" Pipe-Machine, 2½ to 10-in. cap'y. Motor driven

A 36-in. Gear Cutter



"Gould and Eberhardt" Automatic 36-in. Spur-Gear-Cutter, Motor Dr.

McCABE & SHEERAN MACHINERY CORPORATION
(REG. U. S. PATENT OFFICE)

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MOREY Dependable Used Machines

BULLARD 24" Vert. Boring Mill — Rapid Prod. Side Head—M.D.
INGERSOLL 44"x36"x8' Planer Miller — 2 Heads on Adj. Rail—P.R.T.—M.D.
McCABE 24x42"x14' Double Spindle Lathe
SELLERS 42" Car Wheel Lathe
FOSTER No. 1F Fastermatic Turret Lathe
NATCO No. 11 & No. 12 Multi Spdl. Drills
SIPP 3 spindle High Speed Drill
COLBURN No. 2 four spindle Drill
B. & S. No. 4-48" Gear Cutter
GOULD & EBERHARDT 24" x 8" Spur & Bevel Gear Cutter
GLEASON 24" Bevel Gear Planer
GLEASON 37" Bevel Gear Planer
GLEASON 6"-11" Bevel Gear Generators
La POINTE No. 2 and No. 4 Broach. Mches.
LANDIS 3½" Internal Hydraulic Race Grinder
HEALD Nos. 55-60-65 Internal Grinders
HEALD No. 22-12" Rotary Surface Grinder
INGERSOLL 24"x24"x12' Slab Miller
P & W 6"x132" Thread Miller
CINCINNATI 44"x44"x15' Planer — 2 rail heads, 1 side head—M.D.
GRAY 48"x48"x16' Planer—2 Rail Heads 2 Side Heads—M.D.
CLEVELAND 1¼" Model "A" Automatic Screw Machine
CLEVELAND ⅝" Model "B" Automatic Screw Machine
COCHRANE & BLY No. 5 & No. 6 Cold Saws
ESPEN LUCAS No. 138 Cold Saw—Cap. 12" Rd.
NEWTON No. 200 Cold Saw—Cap. 11" rd.
CLEVELAND No. 1 Plate Planer—21' cap.
FREW Single Spindle Profiler
ACME 1" All Steel Upsetter
AJAX 3" All Steel Upsetter
SAUNDERS 8"-18" Pipe Threader, M.D.

THIS IS A PARTIAL LIST—Write us your specific inquiries.

MOREY MACHINERY COMPANY

410 BROOME STREET, NEW YORK, NEW YORK

"MACHINES HARD TO FIND"

2" Landis Double Head Bolt Cutter
3" Landis Single Bolt Cutter with lead screw
30"x84" Diamond Face Grinder, m.d.
1—30"x30"x8' Gray Spur Gear Planer, 2 hds.
Rockford Single End Hydraulic Boring Unit with 2-sta. 54" dia. table
Rockford Double End Hyd. Horiz. Boring Unit, m.d.
1—No. 60 NATCO 3-way Mult. Spdl. Drilling Machine, m.d.
No. 13 NATCO Mult. Drill, rect. hd., bored 34 spdls.
No. 13H NATCO Hyd. Multiple Drill, m.d.
No. 30 NATCO 24x40" Head Multiple Drill
No. 40 NATCO Straight Line Multiple Drill
6' Prentice Radial, cone drive
1—6' Niles Plain Radial Drill
Slotting Attach. for No. 1 B. & S. Miller
Vertical Attach. for No. 2 Milwaukee Miller
Slotting Attach. for No. 2 Milwaukee Miller
Porter-Cable H.S. Vertical Attachment

Your inquiries will be appreciated.

The Strong, Carlisle & Hammond Company

1392 West Third Street,
CLEVELAND, OHIO

Branch Office: 2832 East Grand Blvd.
DETROIT, MICHIGAN

HILL-CLARKE QUALITY

BORING MACHINES

No. 1 Barrett, 3¾" bar
No. 2 Barrett, 5" bar

BORING MILLS

42" Gisholt

DRILLS

No. 1—1 spdl. Leland-Gifford
1 spdl. Henry & Wright
2 spdl. Leland-Gifford Bench
2 spdl. Foote-Burt Sipp
2 spdl. Henry & Wright
4 spdl. Sigourney
4 spdl. Henry & Wright
6 spdl. Henry & Wright
No. 2—4 spdl. Colburn
No. 3 Baker 2 Spdl. Cyl. Borer
No. 5D Moline 4 Spdl. Cyl. Borer
24"—2 spdl. Foote-Burt
No. 17—2 Spdl. Foote-Burt Rail
No. 4—5 spdl. Foote-Burt Rail
No. 1 Baush Multiple
5' Western Heavy Plain

GEAR CUTTERS

No. 2—6" Bilton
No. ½, Pfauter Hobber.
No. 4—36" Brown & Sharpe
No. 4-48" Brown & Sharpe.
No. 5-48" Brown & Sharpe
No. 6-72" Brown & Sharpe.
No. 6-A-72" Cincinnati.
96" Newton Spur Gear

GRINDERS

HILL-CLARKE PRODUCTION UNIVERSAL MOTOR DRIVEN
12" x 36" 12" x 50" 12" x 72"

(*See page 350—special advertisement*
Hill-Clarke Cylindrical Grinders)

No. 40 Bryant Wide Wheel, Oscillating
No. 2½ Universal (Bath Type)
No. 5 Springfield Planer Surface
No. 2—18" Gardner Disc
No. 18 Bryant Internal
No. 60 Heald Cylinder
No. 10 Lees-Bradner Spur Gear Grdr.
24" Cincinnati Face Mill

MFG. LATHES

3½"x108" Fitchburg Lo-Swing.
No. 4AC LeBlond Auto. Crankshaft

ENGINE LATHES

18"x6' Bradford Geared Head
24"x22' Lodge & Shipley, Taper Attach.
26"x10' Bridgeford Plain Turning
20"-40"x10' Rahn - Larmon Geared Head Sliding Bed Gap.
30"x12' Whitcomb-Blaisdell

MILLERS

24"x24"x12' Ingersoll Adj. Rail.
36"x36"x12' Newton Duplex.
60"x57"x8' Beaman & Smith Duplex

PLANERS

24"x24"x6' Powell.
24"x24"x6' Rockford.
24"x24"x12' Gray.
30"x30"x8' American.
30"x30"x8' Powell.
36"x36"x8' Cincinnati
36"x36"x12' American 2 hds.
36"x36"x18' Cincinnati
48"x48"x10' Niles-Bement-Pond, 2 heads.

PRESSES

No. 303 Bliss S.S., Geared.
No. 42½ Pels Beam Shear

TURRET LATHES

2¼"x26" Greenlee, Cross Sliding Turret
2¼"x26" Greenlee, A.C. and R.F.
3"x36" Pratt & Whitney, A.C. & B.F.
3"x36" J. & L. 2 spdl.
21" Gisholt, 3¾" H.S.
24" Steinle, 6¼" H.S.

MISCELLANEOUS

No. 3-B J. N. La Pointe Broach
No. 4 J. N. La Pointe Broach
5" Saunders Pipe Machine
12" Bignall & Keeler Pipe Mach.
60" Quickwork Rotary Shear
No. 1 Garvin Tapper
No. 4 Gatermann Pneumatic Tapper
6½" Avey Metal Bandsaw

HILL-CLARKE MACHINERY CO.

645 W. WASHINGTON BOULEVARD, CHICAGO

GRINDERS

No. 1 LeBlond, univ. T & C
16"x48" Landis crankshaft self-contained, complete
No. 3 Univ. D&K, Tool, Cut.
No. 22 Cinc. Univ., T & C., M.D.

LATHES

13"x7' South Bend, Q.C.G., T.A.
(2) 1" Hardinge Prec. Tur.
9" Porter Cable, prod.
12"x5' Hendey QCG. compl.
(2) 15x6' Rockford, Q.C.G.
15"x6' Carrol Jamieson, Q.C.G.
20x10 Walcott, Q.C.G.
22x11 Cisco Q.C.G. M.D.

MILLING MACHINES

No. 2 American, Plain
No. 2 K & T Plain, Compl.
No. 1 Chgo. With Vert. att.
No. 2 Cinc. Univ. Compl.

SCREW MACHINES

No. 00 B&S automatic, comp.
1¼" Smur Kaman, compl.

SHAPERS

12" Rockf., crank, M.D.
15" Kelly, crank, compl.
16" Springfield, crank
16" Lodge & Davis, crank
17" Economic, crank

MISCELLANEOUS

Brake 5' D&K 14 ga., cap.
Radial Drill, 3' Gang, T.A.
5"Victor Pipe Mach., Dies
Planer, 36"x36"x10' N.B.P.
Punch Presses 0 to No. 3 O.B.I.
1B Crescent Metalwasher
10 & 15 KVA Spot Welders

GILMORE MACHINERY CO., **30 S. Clinton St., Chicago**

IMMEDIATE DELIVERY

No. 103 RIVETT INTERNAL GRINDER.
6' BICKFORD RADIAL DRILL—M. D.
36'x12' GOULD & EBERHARDT GEAR CUTTER
1500 lb. CHAMBERSBURG SINGLE FRAME STEAM HAMMER
BRIDGEFORD CENTER DRIVE AXLE LATHE
(will take 12'x8' Axles)

KAMIS ENGINEERING CO. **302 MOORE ST.**
PHILADELPHIA, PA. **HOWARD 8474**

— PARTIAL LIST —

16" Warner & Swasey Turret Lathe, Plain Head, Automatic Chuck
No. 3 Acme Univ. Flat tur. lathe, grd. hd.
2¼"x26" Greenlee Flat turret lathe, cone
14 Ga.x8' Ohl power squaring shear
20" Barnes Self-oiling Drill
No. 12 and No. 13 Natco Drills
Avey 4 & 6 spindle, drills, No. 2 m. t.
No. 1B & No. 2B Edlund two spindle, B.B. drills
No. 2X Garvin Tapping Machines
16"x66" Landis Universal Grinder Overhead Belt Drive
10' Robinson Toggle press brake
3 Spindle Kern. B.B., drill with tapping heads
18"x8' Chard Lathe s.q.c.g., cone
16"x8' South Bend Lathe L.C.G. Cone

IROQUOIS MACHINERY CO.
660 Ohio Street, **Buffalo, N. Y.**

LATHES

36"-60" Harrington Sliding Bed Gap; bed closed 16'—open 23'
20"x12' Ledge & Shipley
14"x6' Hendey

TURRET LATHES

24" Gisholt; 6⅛" hole; Taper Attach.; M.D.
21" Gisholt; 3⅛" hole; Taper Attach.; M.D.

GEAR CUTTERS

84"x16" Gould & Eberhardt
60"x12" Gould & Eberhardt
11" Gleason Bevel Gear Generator

RADIAL DRILL & DRILL PRESSES

3' American Sensitive Radial Drill
6-spindle National Acme Horizontal
4-spindle Hoefer
1-spindle Leland Gifford B.B. Hi Speed

MISCELLANEOUS

AUTOMATIC, No. 6A Potter & Johnston; MD
BOLT THREADER, 2½" Landis Double Head; 2 leadscrews; Landis Hds.; M.D.
KEYSEATER, 3A Mitts & Merrill
MILLER Rotary, No. 3 Davis & Thompson
PIPE MACHINES, 2" Jarecki, 10" Standard Engineering
PLANER, 24"x24"x8' Chandler
RIVETER Hydraulic, 150-ton Chambersburg 6" stroke; depth of gap 150"
SHEAR, No. 2 Lennox Bevel; ¾" capacity
SHEAR, H. & J. Throatless Geared Slitting
SLOTTER, 24" Newton

SUN MACHINERY COMPANY, **36 VAN VECHTEN STREET, NEWARK, N. J.**

HIGH GRADE TOOLS

AUTOMATICS

1" Cleveland Model J double end threading, pointing, turning or drilling
1½" Cleveland Model M, 4-spdle.
1¼" No. 55 Natl. Acme 4 spdle.
2" Cleveland Model A
No. 33 New Britain chucking
No. 34 New Britain chucking
14"x19" Fay

AIR COMPRESSORS

136', 8"x8" Chicago Pneumatic Tool Co., type N8S.
136', 8"x8" Ingersoll Rand, type ER1
357', 12"x10" Bury, class HL
550', Natl. 3-cylinder vertical
620', 14" x 8½" x 10" Sullivan, class WJ3, angle compound, 2 stage, synchronous motor
706', 17" x 9½" x 12" Sullivan, class WJ3 angle compound, 2 stage
868', 17" x 10" x 12" Chicago Pneumatic Tool Co., type OCB, 2 stage

BROACHES

No. 1 LaPointe, screw type
No. 2 Stand. screw type broaching press
No. 3 J. N. LaPointe dbl. screw type
No. 3 American high speed, rack type
No. 4 LaPointe of Hudson, scr. type
2 ton American vertical

BULLDOZERS

No. 5 Williams & White 16¼"x 63" crosshead
No. 6 Williams & White
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14"x8" No. 5A Lees Bradner universal hobbers
26"x8" No. 3 Brown & Sharpe auto spur
36"x6" Gould & Eberhardt spur gear cutter
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No. 3 Barber Colman hob grinder

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14"x8' LeBlond
14"x8' Lodge & Shipley
14"x8' Monarch
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16'x8' American
16"x10' Monarch
18"x8' American
18"x8' Walcott
18"x8' Monarch
18"x8' Whitcomb Blaisdell
19"x8' Sidney
20"x10' American
20" (22") x10' Davis, dbl. b-gd.
24"x10' Schumacher & Boye, dbl. back gears, taper att.
24"x10½' New Haven std. chg. gear
24"x10' Reed Prentice
24"x12' Lodge & Shipley
24"x14' Schumacher & Boye
24"x16' Schumacher & Boye dbl. back gears, taper att.
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36"-47½"x21'6" Wickes Q.C.G.

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14" Warner Swasey
No. 3 Woods tilted turret
No. 3 Barlows
21"x24" & 3"x36" Jones & L.
24" & 28" Steinle

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16"x5' Monarch Mfg. or rapid production
18"x7'-6" Wickes geared head, rapid production
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Melling 6 cyl. Crankshaft lathe
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No. 14A Garvin plain
No. 3½ Fox hand
No. AB Becker vert.
No. 5 Brown & Sharpe vert.
No. 6 Becker vertical
No. 1 Knight vert.
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60" Ingersoll rotary
Nos. 1 & 1A Davis & Thompson
No. 45 Bilton Productomatic
No. 10 Bilton Productomatic
12" Cincinnati plain Mfg.
No. 33 Kempsmith Mfg
No. 30 Sundstrand Rigidmil
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14"x6' Rockford
14"x8' American
16"x8' American
18"x10' Mueller
26"x10' LeBlond, Universal Crankshaft

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No. 1 Standard Hand
20"x7x17 Oesterlein Plain
2" Pratt & Whitney spline (duplex)
24"x7"x18" Oesterlein Universal
No. 0 Van Norman
No. 20 Garvin Vertical

BORING MILLS

51" Bullard, Vertical, 2 Heads

GEAR MACHINERY

No. 61 Fellows Gear Shaper
No. 712 Fellows Gear Shaper
No. 65 Fellows Gear Shaper
No. 4-48" Brown & Sharpe Gear Cutter
Lees Bradner Gear Grinder (2)

PUNCH PRESSES

No. 3 Adriance, Inclinable
No. 23 Adriance, Horning
No. 23 Stoll, Horning
No. 5 Adriance, Inclinable
No. 6 Adriance, Inclinable
No. 225 Adriance, Solid back
3-No. 100 Waterbury-Farrell
No. 50 Mossberg & Granville

TURRET LATHES

6"x6 1/4" Gosa & DeLeeuw Model A Chucking
31"x36" Acme Flat Turret
2 Spindle J & L Steel Head

MISCELLANEOUS

No. 1 Foote Burt Duplex Surface Broach
No. 4 Hilles & Jones Dbl. End Punch & Shear
8" Weiland Standard Pipe Machine
2" Acme Bolt Threader

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A War Message to ALL EMPLOYERS
See page 293

★ V ★ ...—

HAND SCREW MACHINES

No. 4 Bardon & Oliver, Bar, Pwr. to Turret
No. 3 Bardon & Oliver, Bar, Pwr. to Turret
No. 3 Foster, Bar Feed
No. 4 Foster, Bar Fd., Pwr. To Turret
No. 2 Woods, Bar Fd., Collets & Tooling
No. 0 B. & S. Wire Fd. Auto. Chuck
No. 1 P. & W. Wire Fd.
No. 2 Warner & Swasey, Wire Fd.
3¼"x40" Greenlee Pwr. Cross Fd. to Turret

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2" to 12" Inside
1" — 2" — 3" Depth

DRILLS

Barnes Camelback, 20" All Grd. Self Oil, Tapper
32" Snyder Geared Dr., No. 5 M.T.
Foote-Burt No. 4 M.T., geared
L & G 3 spdl., pwr. feed, No. 2 M.T.

LATHES

14"x6' Carroll J., Taper, Q.C.
14"x8' Hendey, M.D., Taper Attachment
19"x10' Fulther, Q.C., 2 Chucks
24"x10' Lodge & Shipley Q.C.

SHAPERS

16" Gould & Eberhardt, Vise, Countershaft

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12"x36" Modern, Self Contained
8"x16" Ott Pump and Tank, B.D.
5"x12" Greenfield Hydraulic
Landis No. 1 Internal
W. & M. Auto. Surf., 8"x24" Table
No. 12 Greenfield, Hydro-Matic Internal

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BROWN & SHARPE NO. 19 (REBUILT)
GRIDLEY 4 SPDL., 1⅝" MOD. F
GRIDLEY 4 SPDL., 1¼" MOD. F
GRIDLEY 4 SPDL., ¾" MOD. F
GRIDLEY 4¼" SINGLE SPDL.
GRIDLEY 3¼" SINGLE SPDL.
CONE 4 SPINDLE 1¼"
CLEVE. MOD. B, 1¼", FULL AUTO.
CLEVE. MOD. B, ⅝"-⅞" SER. 32068
CLEVELAND MOD. A, ⅞" CAP.
CLEVELAND MOD. A, 2¼"
CLEVELAND MOD. B, 1¼" 18" FEED

MILLERS

No. 1½ Brown & Sharpe Univ.
No. 000 B. & S. AUTO. MILL, 3 MOS. OLD (COMP.)

MISCELLANEOUS

McKinzie All Steel Chip Separator (Blower Type)
Brown & Sharpe 3"x36" Auto. Gear Cutter
Pratt & Whitney Dble. Table Spline Miller
Bradley Compact Hammer, 125 lb.
Waterbury F. Arch Press, Geared 8" strk.
R. & K No. 2 Punch Press
Klemm No. 2 Cut-Off Saw
Schuster Wire Straightener 3 Ft. Length, 3/16" Cap.

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Rockford 24" sliding head drill
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No. DG55 Ferracute Straight Side M.D.
No. 3A Bliss Straight Side, M.D.
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No. 2 Milholland Turret Lathe
No. 5B Becker Vert. Mill, M.D.
8" Fay Automatic Lathes with centers (3)
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3½' Canedy-Otto Post Type, M.D.

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No. 1, 2 Warner & Swasey
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No. 3 Foster
No. 3 Barlons & Oliver
1—¾", 1¼" Pratt & Whitney

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1—McCabe 42"x45"x20" 12 speed GH, MD.
2—Porter-Cable 9" S.P.D.
1—22"x12' L & S., 12 sp. G.H., M.D., T.A.
1—20"x10' Lodge & Shipley, T.A.
1—14"x6' Monarch Q.C.G.
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4-12" Buffalo High Speed
16" Sipp High Speed
21" Buffalo B.G.
22" Barnes
25" Snyder P.F.

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4' Reed Prentice Gear Box, M.D., Oil Groove Base

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No. 13 Garvin Plain
No. 4 Cincinnati Plain

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32"x20' Fifield Triple Geared, 14' centers
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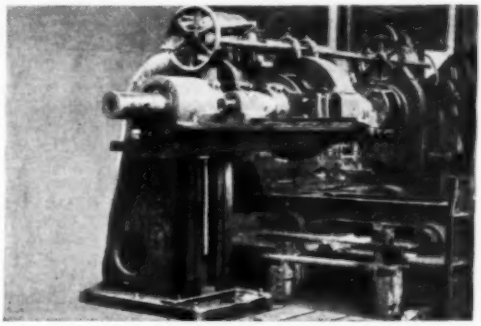

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GRINDER, 12"x30" Modern, plain cylindrical
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LATHE, 18x6 Wickes, Production, belt, QC.
LATHE, 30"x20' LeBlond, motorized q.c.
27"x24' Lodge & Shipley, belt, plain change
LATHE, 20"x10' Lodge & Shipley, motorized, 8 speeds, Q.C.
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MILLER, No. 4 Cincinnati plain, motorized table 16"x63" w.s.
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Filing Machine, No. 2 Cochrane-Bly, Belted
Filing Mach., No. 2 Cochrane-Bly
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Grinder & Buffer, ½ HP. 1/60 cy.
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Lathe, bench, 8"x30" Ames, collets, thrd. att.
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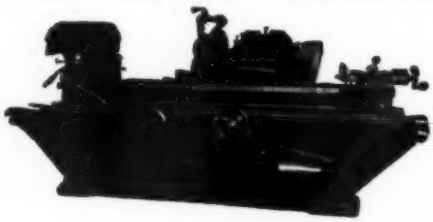

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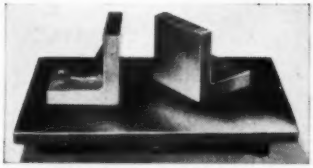

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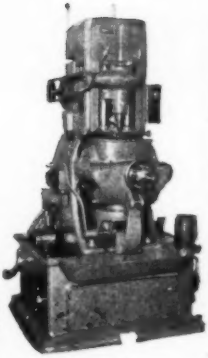
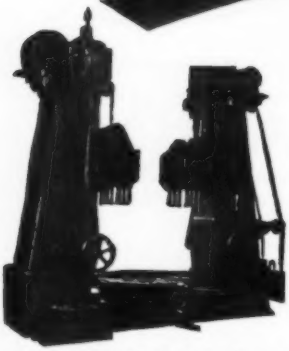
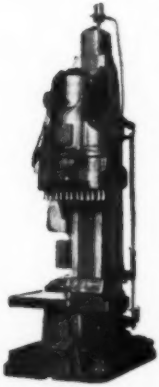


Krueger Honer



Beaman & Smith Cylinder Borer

Krueger Wheel Facer



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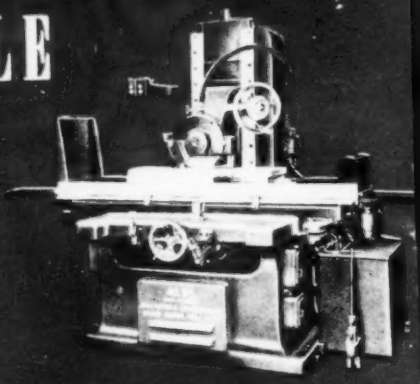

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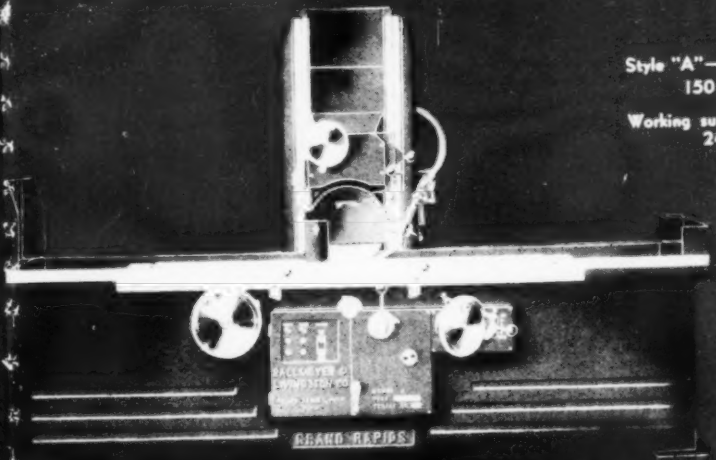

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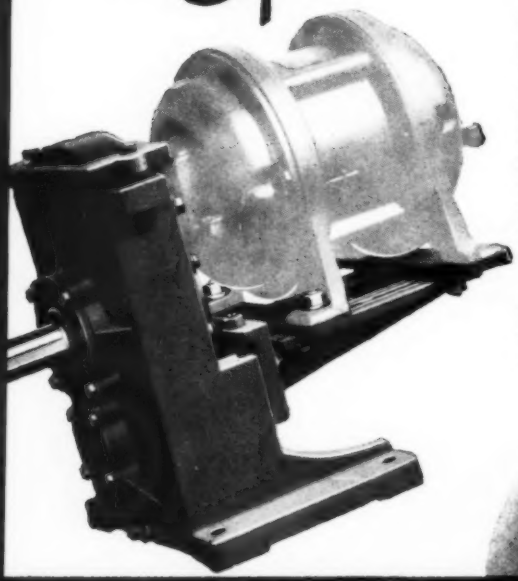

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